NATIONAL CAR BUILDER

VOLUME XII. NUMBER 10.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

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Westinghouse Air Brake Co., Pittsburgh, Pa. xxiv

Axles:
Midvale Steel Co., Phila. xiii
Nashua Iron & Steel Co., H. L. Leach, Agent, Boston .. xxv
New York Steam Forge Co., 46 Cortlandt st., N. Y. ... xxvi
Wilson, Walker & Co., Pittsburgh, Pa. xxix

Bell Cord and Couplings:
Wellington Bros. & Co., Agents, Boston, Mass. (cover). 2

Belt Fastenings:
Thacher & Co., 334 Euclid avenue, Cleveland, O. xxvi

Boiler Covering:
H. C. Bradley & Co., Chicago, Ill xxiv

Bolts:
Elba Iron & Bolt Co., Pittsburgh, Pa. xix
Hoopes & Townsend, Philadelphia, Pa xxi
Plumb, Burdict & Barnard, Buffalo, N. Y. (cover) ... 4

Bolt Cutters:
Howard Iron Works, Buffalo, N. Y. vi

Cars:
Bradley Car Works, Worcester, Mass. xxiii
Cleveland Bridge & Car Works, Cleveland, O. iv
Erie Car Works, Erie, Pa. (Limited) iv
Gill Car Co., Columbus, Ohio iv
Harlan & Hollingsworth Co., Wilmington, Del. v
Harrisburg Car Mfg. Co., Harrisburg, Pa. xxix
J. M. Jones & Co., Schenectady, N. Y. v
Lehigh Car Wheel & Axle Works, Catasauqua, Pa. v
Litchfield Car and Machine Co., Litchfield, Ill. iv
Michigan Car Co., Detroit, Mich. iv
Middletown Car Works, Middletown, Pa. v
Pardee Car Works, Watsontown, Pa. iv
Pennsylvania Car Works, Detroit, Mich. xxvii
John Stephenson Co. (Limited), New York, N. Y. iv
Wason Manufacturing Co., Springfield, Mass. v
Wason Car & Foundry Co., Chattanooga, Tenn. iv

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Tanite Co., Stroudsburg, Pa. (cover) 4

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W. Y. Perry, General Agent, Chicago, Ill. ii

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Theo. W. Morris & Co., 27 Chambers st, N. Y. xx

Car Heater & Ventilator:
Jas. Spears, Philadelphia, Pa. xxii

Car Lamps:
Hicks & Smith, New York xxiii
Willard H. Smith, 348 Pearl st., New York viii

Car Roofs:
A. P. Winslow & Co., Cleveland, O. ii

Carpets:
W. & J. Sloane, New York xxix

Car Seats:
Geo. Buntin & Co., Philadelphia, Pa. xxiv
Hale & Kilburn Mfg. Co., Phila., Pa. xxviii

Car Springs:
F. M. Atkinson & Co., Chicago, Ill. xxx
Cliff & Righter, 5 Dey street, N. Y. ..... (cover 3) v, xix
Columbia Car Spring Co., 322 Seventh ave., N. Y. (cover) 3
Diamond State Car Spring Works, Wilmington, Del (cover) 3
A. French & Co., "Elliptic," Pittsburg, Pa. i
A. French & Co., Philadelphia, Pa. (cover). 3
French Spiral Spring Co.; Pittsburgh, Pa. xxx
Detroit Car Spring Co., Detroit, Mich. xxx
J. Jeffries & Son, Philadelphia, Pa. (cover) 3
Keystone Spring Works, Philadelphia, Pa (cover) 3
Miller, Metcalf & Parkin, Pittsburgh, Pa. (cover) 3
National Car Spring Co., 13 Barclay st., N. Y. (cover). 3

Car Stoves:
"The Eaton," Sherburne & Co., Boston, Mass. xxi
A. P. Winslow & Co., Cleveland, O. xxvii

Car Trimmings:
D-ll & J. C. Noblit & Co., Philadelphia, Pa. xx

Car Trucks:
Thielsen Truck Co., Chicago, Ill. xxvi

Car Wheels:
Allen's Paper Car Wheel Co., 240 Broadway, N. Y. vi
Allston Car Wheel Co., Boston, Mass. vii
Baltimore Car Wheel Co., Baltimore, Md. vi
Bowler & Co., Cleveland, O. vi
Cayuta Wheel & Foundry Co., Waverly, N. Y vi
Davenport, Fairbairn & Co., Erie, Pa. vi
The Gill Car Manufacturing Co., Columbus, Ohio iv
Lobdell Car Wheel Co., Wilmington, Del. vii
Maher & Brayton, Cleveland, O. vi
Mowry Car Wheel Works, Cincinnati, O. vi
Ramapo Wheel & Foundry Co., Ramapo, N. Y. vi
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa. v
Taylor Iron Works, High Bridge, N. Jersey vi
A. Whitney & Sons, Philadelphia, Pa. ii

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S. L. Merchant & Co., Broadway, N. Y. (cover) 2

Chains:
Union Chain Works, Pittsburgh, Pa. xxiii

Chilled Car-Wheel Grinding Co:
Carson, Nevada, and 11 and 13 Fifth ave., Chicago, Ill. vii

Coal:
Morley, Marshall & Co., Chicago, Ill. xxix

Curled Hair and Glue:
Baeder, Adamson & Co., New York (cover) 4
Clare Fibre Co., Jersey City, N. J. (cover) 2

Desks:
A. H. Andrews & Co., Chicago, Ill. xx

Deflectors:
Globe Ventilator Co., Troy, N. Y. xxviii

Draw-Bars:
Continuous Draw-Bar Co., 945 Ridge ave., Phila, Pa. ... ii
J. B. Safford, Buffalo, N. Y. xxx
Wilson, Walker & Co., Pittsburgh, Pa. xi

Drawing Instruments:
W. Y. McAllister, Philadelphia, Pa. xxiii

Emery:
Henry A. Page, Boston, Mass. vi
Walpole Emery Mills, Boston, Mass xxi

Emery Wheels:
The Tanite Co., Stroudsburg, Pa. (cover) 4

Encaustic Tiling:
S. L. Merchant & Co., 41 Broadway, N. Y. (cover) 2

Engraving:
Moss Engraving Co., New York xxviii
Northwestern Engraving Co., Chicago xxi

Excavators:
Industrial Works, Bay City, Mich. xxviii

Flexible Shafting:
Stow Flexible Shaft Co., Philadelphia, Pa. xxviii

Forges:
Empire Portable Forge Co., Cohoes, N. Y. xx
Holt Manufacturing Co., Cleveland, Ohio xxix

Frogs & Crossings:
H. & H. Elliot, East St. Louis, Ill. xxiii

Glass Chimneys (Car Lamp and Head Light):
New England Glass Works, Boston, Mass. xx

Grain Doors:
D. F. VanLiew, Aurora, Ill (cover) 4

Hand-Car:
Sheffield Velocipede, H.W. Peabody & Co., Boston, Mass. xxvi

Hoisting Engines and Boilers:
H. G. Wormer & Co., Chicago, Ill. xxiii

Horse Power:
Taylor's Horse Power Co., Chicago, Ill. (cover) 2

Hydraulic Jacks:
R. Dudgeon, 24 Columbia st., New York ix
Philip S. Justice, Philadelphia, Pa. xxvi

Inks: (Writing)
Carter, Dinsmore & Co., 36 Dey street, N. Y. (cover). 2

Injectors:
"Hancock Inspirator Co." Boston, Mass. xi
"Monitor," Nathan & Dreyfus, N. Y. xi
Wm. Sellers & Co., Philadelphia, Pa. xxiv
National Tube Works, New York, Boston and Chicago. xi

Iron:
Ewald Iron Co., St. Louis, Mo. xi

Journal Bearings:
George R. Meneely & Co., West Troy, N. Y. ii
Granular Metal Co., Boston, Mass. xxvi
D. A. Hopkins, 143 Liberty St., N. Y. xv
Leroy Journal Bearing Co., New York xi
Phosphor-Bronze Smelting Co., Phil., Pa. (Limited) ... xxiv

Journal Box Lids:
Hewitt Box Lid Cover Co., Chicago, Ill ii

Leather:
C. R. Yandell & Co., New York xxiv

Lifting Jack:
F. M. De Weese, Chilliecothe, Ohio xxvii
Joyce, Cridland & Co., Dayton, O. ii
Seeger Manufacturing Co., Springfield, Mass (cover). 2

Locks:
D. K. Miller Lock Co., Philadelphia, Pa. xxix

Locomotives:
Baldwin Locomotive Works, Philadelphia, Pa. x
Danforth Locomotive & Machine Co., Paterson, N. J. ... x
Manchester Locomotive Works, Manchester, N. H. x
Pittsburg Locomotive & Car Works, Pittsburg, Pa. x
Rogers Locomotive and Machine Works, Paterson, N. J. x
Schenectady Locomotive Works, N. Y. x

Locomotive Tubes:
National Tube Works, Boston, Chicago and New York xi

Lubricators:
Belt and Leather Stuffing Co., Boston, Mass. xxix
A. Bridges, 46 Cortlandt St., N. Y. xxviii
Eagle Car-Box Lub. Co., N. Y. xxv
Frazer Lubricator Co., Chicago, Ill. xxi
A. Middleton, 945 Ridge ave., Philadelphia, Pa. xxx

Lumber:
Adams & Lord, Chicago, Ill. xxix
The Soper & Pond Co., Chicago, Ill. xxiii
W. R. Burt, Buffalo, N. Y. xxix
Vanderbilt & Hopkins, 120 Liberty st., N. Y. v

Lumber Dryer:
"Excelsior," Curran & Wolff, Chicago, Ill. iii

Machinists Tools:
Wm. Sellers & Co., Philadelphia, Pa. xxvii
Niles Tool Works, Hamilton, O. ix
L. B. Flanders, Crank Pin Machines, Philadelphia, Pa. x

Mahogany, Fancy Woods & Veneers:
The E. D. Albro Co., Cincinnati, O. (cover) 2
John R. Graham, New York xxiv
J. H. Monteath, 151 Centre street, New York xxix
Geo. W. Read & Co., 180 Lewis st., N. Y. i
Hugh Shiels & Co., Cincinnati, Ohio xii

Marqueterie:
J. Bernard, 101 Greene st., N. Y. xxix
Chas. W. Spurr, Boston, Mass. xxiv

Oils:
Galena Oil Works (Limited), Franklin, Pa. xxv
Signal Oil Works, Franklin, Pa. xxv

Oil-Box Covers:
Vulcanized Fibre Co., Wilmington, Del. xxiv

Paints:
H. G. Newton, "Asbestos," 197 Pearl street, N. Y. xxv
C. H. Howell & Co., Philadelphia, Pa. viii
"Cement" Cary, Ogden & Parkes, Chicago, Ill. viii
Iron Clad Paint Co., Cleveland, Ohio (cover) 2
J. W. Masury & Son, New York ix
Lowe's Metallic Paint Co., Chattanooga, Tenn. iii
Prince M'fg Co., 71 Maiden Lane, N. Y. (cover) 2
D. F. Tiemann & Co., 19 Park Place, 16 Murray St, N. Y. ix

Power Hammers:
Bradley & Co., Syracuse, N. Y. xx
S. C. Forsaith & Co., Manchester, N. H. xxi

Pumps:
Crane Brothers Manufacturing Co., Chicago, Ill. ii
H. R. Worthington, 239 Broadway, New York. (cover).. 2
Rumsey & Co. (Limited), Seneca Falls, N. Y. vi

Railroad Supplies:
Ewing, Mitchell & Co., Pittsburgh, Pa. xi
L. G. Tillotson & Co., 5 and 7 Dey st., New York xxix
Post & Co., Cincinnati, O. xxvii
Woodrow & Stewart, Cincinnati, O. xxiv

Railroad & Machinist Supplies:
Jackson & Tyler, Baltimore, Md. xxvii
Campbell & Lill, Chicago, Ill. xxx

Railway Car and Locomotive Forgings:
Wilson, Walker & Co., Pittsburgh, Pa. xxiv

Rochester Machinery Manufacturing Co.:
H. G. Wormer & Co., Chicago, Ill. xxiii

Safe:
Wm. H. Butler, 291 Broadway xxvi

Safety-Nut:
The Atwood Safety-Nut Co., Springfield, Mass. (cover).. 3

Safety Valves:
Ashton Valve Co., Boston, Mass. x

Sand Paper and Emery Cloth:
Baeder, Adamson & Co., N. Y. (cover) 4

Sash Balances:
O. K. Gardner, Pittsburgh, Pa. xxv

Sash Locks:
Universal Sash Lock Co., Albany, N. Y. xxvi

Shafting:
Wm. Sellers & Co., Philadelphia, Pa. xxvii

Sheet-Iron:
A. A. Thomson & Co., Water street, N. Y. xi
W. D. Wood & Co., Pittsburgh, Pa. vii

Steel:
Crescent Steel Works, Pittsburgh, Pa. (cover) 3
Hussey, Howe & Co., Pittsburgh, Pa. xxvii
The Philadelphia Steel Forge, Phila., Pa. (cover) 4
Midvale Steel Co., Philadelphia, Pa. xi

Steel Castings:
Eureka Cast-Steel Co., Philadelphia, Pa. xxiii
Chester Steel Castings Co., Philadelphia, Pa. xxvi
Midvale Steel Co., Philadelphia, Pa. xi

Steel Tires:
Midvale Steel Co., Philadelphia, Pa. xi
Standard Steel Works, Philadelphia, Pa. xi

Stone Breakers:
Gates & Scoville Iron Works, Chicago, Ill. xxviii

Tackle Blocks:
Bagnall & Loud, Boston, Mass. xx

Taps and Dies:
The Fratt & Whitney Co., Hartford, Conn. xxv

Track Tools:
Metcalf, Paul & Co, Pittsburgh, Pa. xxx

Varnishes:
John Babcock & Co., Boston, Mass. viii
Berry Brothers, Detroit, Mich., 96 John street, N. Y.... xii
Moses Bigelow & Co., Newark, N. J. viii
Clarence Brooks & Co., New York ix
F. W. Devoe & Co., New York viii
J. W. Masury & Son, New York ix
Parrott Varnish Co., Bridgeport, Conn. (cover) 4
Valentine & Co., 323 Pearl street, New York viii

Veneers, Papered:
Chas. W. Spurr, Boston, Mass. xxiv

Ventilators:
Globe Ventilator Co., Troy, N. Y. xxviii
Willard H. Smith, 348 Pearl st., N. Y. (cover) 4

Waste (Cotton and Woolen):
J. Milton Hagy, Philadelphia, Pa. xxix
National K'y Patent Waste Co, New York xx

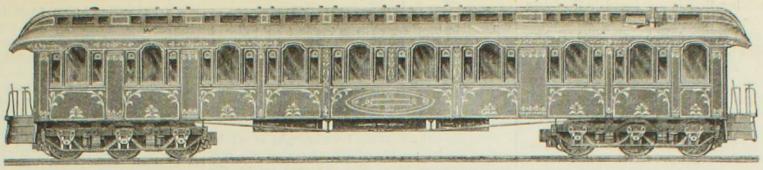
Water Supply:
E. C. Leffell, Springfield, Ohio xxii
U. S. Wind Engine & Pump Co., Batavia, Ill. xxiv

White Lead:
John Jewitt & Sons, 181 Front street, N. Y. xix
J. T. Lewis & Bros., Philadelphia, Pa. xxv

Wire Fence:
American Fencing Co., New York (cover) 2

Wood-Working Machinery:
Martin Buck, Lebanon, N. H. x
Cordeman, Egan & Co., Cincinnati, O. vii
S. C. Forsaith & Co., Manchester, N. H. xxv
Goodell & Waters, Philadelphia, Pa. xx
McIver Bros & Co., Worcester, Mass. xxi
C. B. Rogers & Co., Norwich, Conn. xxvii
Rollstone Machine Co., Fitchburg, Mass. xx
H. B. Smith Machine Co., Philadelphia, Pa. xxviii
Witherby, Rugg & Richardson, Worcester, Mass. (cover). 4

THE NATIONAL CAR-BUILDER.



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Miscellaneous Items.

THE Wabash, St. Louis & Pacific road is building new car shops at Decatur, Ill.

THE Baltimore & Ohio fast passenger locomotives running between Baltimore and Washington, have 19x24 cylinders and 6-foot drivers. The valves have 6-inch travel, $\frac{7}{8}$ in. outside, and no inside lap.

THE new and uncompleted works of S. B. Shaw & Co., of St. Louis, designed originally for the manufacture of iron and steel rails, are to be changed into car works.

SEVERAL new postal cars are to be built at the Lake Shore shops at Adrian, Mich. They are intended for the New York & Chicago line, and will be models in construction and equipment.

THE Atchison, Topeka & Santa Fe road has a 17 × 28 cylinder passenger engine which is very efficient on steep grades, and will start a heavier train on them than any other engine. The road is building several more of them.

THE Milwaukee, Lake Shore & Western road is receiving from the Barney & Smith Co. 250 box, and also some caboose cars, 34 and 28 ft. long respectively. The road has adopted a light drab as the standard color for all its cars.

THE Chicago, Burlington & Quincy road has two consolidation locomotives in service on the division between Aurora and Galesburg. It is getting ten more from the Baldwin works, and ten standard 8-wheel engines from the Manchester works.

THE Illinois Central shops at Chicago have just completed 25 Tiffany refrigerator cars. Some suburban cars have also been built at these shops and are proving very acceptable to the public. They are 45 ft. long in the body, seat 54 passengers, and weigh only 15 tons.

THE Capital City Car Works, of Columbus, Ohio, are about completed, and will have a capacity of ten freight cars a day. The arrangement and fitting up are such as to secure the utmost convenience and saving of time and labor. They have orders in hand for 1,200 cars to begin on.

THE standard passenger car upon western roads is 15 feet high and 10 feet 3 inches wide. The widest car that can get through some of the bridges and tunnels between New England and the West is 10 feet. It is claimed that the extra 3 inches gives more commodious seats and berths.

THE New York Central is putting driving-wheel brakes on its passenger engines, the brakes being an improved attachment to the Westinghouse air-brake. Both train and engine brakes are thrown on and off by the same lever, although the attached driver-brakes can be operated when an engine is disconnected.

THE Litchfield (Ill.) Car Co. has work in hand for several months ahead, upon orders for the various classes of freight cars for Western and Southwestern roads. It has just completed six combination baggage, mail and passenger cars for the Eastern Texas — length of bodies 48 feet, and seating 34 passengers.

MR. W. S. ROGERS, of Columbus, O., has patented an invention for lighting the platforms of passenger cars. It consists of a curved mirror or reflector placed at an angle under the hood, so as to receive the light from a lamp reflector inside the car through a glass panel, and throw it on the platform. Such a convenience can hardly fail to be appreciated.

THE Aurora (Ill.) shops of the C., B. & Q. road are building 8 palace parlor cars which will be unsurpassed in elegance and convenience. They will have reclining chairs, and among other novelties, a baggage and coat room in hotel style. The cost is estimated at $10,000 each. They will run between Chicago and Kansas City and Des Moines and Omaha.

A NEAT little volume of 64 pages on "The Treatment of Steel," has been issued by Miller, Metcalf & Parkin, of Pittsburg, embodying a series of circulars on heating, annealing, forging and tempering. It is handsomely illustrated, and the information it contains will be appreciated by the manufacturers and users of the product in its diversities of quality, treatment and management.

A SYSTEM of lighting railroad cars with gas has been tried on the Baltic Railway. The gas is made on the cars by the action of sulphuric acid and zinc, the resulting hydrogen being carbureted by being passed through naphtha vapor. It is said that the gas has very little odor, that its flame is bright, white and constant, and that it is cheaper and gives better results than stearine candles.

THE discomfort of traveling in India in hot weather is decreased on the line of the great Indian Peninsular company by an ingenious device. The windows in every first-class railway carriage are provided with screens made of fragrant khas khas grass, which are kept constantly damp by mechanism connected with the wheels. By this means the air is kept sweet and comparatively cool.

AT the Kansas City shops of the K. C., F. S. & G. road, about 150 cars are built a year, including way and mail cars. The road is adopting the M. C. B. standard axle and journal bearing, and substituting curtains for blinds in passenger cars. It also has continuous draw-bars on 800 freight cars, and is putting them on all new cars. Six reclining-chair cars will soon be added to its passenger equipment.

TIFFANY REFRIGERATOR CARS have delivered dressed beef in Boston in six days from Chicago, and in perfect condition. The outside temperature when shipped was 80, and from 42 to 44 inside the cars on arrival. But a small quantity of ice is used in the cars, and no salt, and they are thoroughly ventilated. The National Dispatch Line has now 300 Tiffany cars running between Chicago and Boston. This looks like a revolution in this branch of the provision business.

IT is now proposed that locomotive engineers shall do their own bell-ringing. They already do the whistling, and on passenger trains the braking; and some inventive demon is doubtless arranging a plan by which they can do their own "firing." And while they are doing all this they must look out for signals, train robbers, malicious obstructions and carry a silver watch that will run like a chronometer. In a word, engineers are expected to make themselves generally useful.

IN Brazil, within an area of half a square mile, Agassiz counted 117 different kinds of wood, many of them admirably fitted by their hardness, tints, and beautiful grains, for the finest cabinet work. The tortoise-shell wood, undoubtedly the most precious wood in the world, is found in large quantities on the upper Amazon, where the water can be most easily supplied as motive power. Other woods, which are rivals of the most beautiful walnut, are wasted yearly on the Amazon in amounts ample enough to veneer all the palaces of Europe.

THE Philadelphia street car lines are waiting the result of the wire-rope system now on trial in Chicago. If it will stand the coming winter there, it will be introduced in Philadelphia next summer. The anticipated advantages are greater speed, better accommodations, and less cost of maintenance. The pipe which contains the rope will be laid between the tracks, but will not interfere with the free public use of the street, as the grooved opening from the surface into the pipe, by which the car is attached to the rope, will be but three-quarters of an inch wide.

THE Jackson & Sharp Co., of Wilmington, Del., has just completed two palace excursion cars for the Worcester (Mass.) Excursion Co. They are 66 feet long in the body, run on six-wheel trucks, and are designed chiefly for hunting parties, who desire to make long trips. The ornamentation and general fitting up are very elaborate and tasteful. The interior is finished in oiled mahogany relieved with marquetry, and is replete with the usual hotel car conveniences, including Paige's patent removable berths. The company is also filling an order for 50 passenger cars for the Denver & Rio Grande road, and also for three special cars for the use of the officers of the road.

THE Ohio Falls Car Co. recently delivered to the Nashville, Chattanooga & St. Louis road two passenger cars. The outside is painted brown, and the inside finished in ash and cherry. The seats are larger than usual, and the windows as wide as the space occupied by the seat. Storm doors are provided, which keep out dust and cinders when the other doors are open. At one end of the car a washstand and mirror have been provided in a small apartment for that purpose. Every new improvement has been introduced, including a steam-heating apparatus, which does away with the necessity of stoves.

THE Petaluma, Cal., *Argus* says that in Sonoma County there is an original and successful piece of

railroad building that is not found in the books. Between the Clipper mills and Stuart's Point, where the road crosses a deep ravine, the trees are sawed off on a level and the timber and ties laid on the stumps. In the center of the ravine two huge redwood trees, standing side by side, form a substantial support, and they are cut off 75 ft. above the ground and cars loaded with heavy saw logs pass over them with as much security as if it were framed in the most scientific manner. There are many places in our redwood forests where this example might be followed profitably, as it would be cheaper to grade through with a cross-cut saw, and lay the ties on the stumps than to remove the trees.

AT Escanaba, Mich., the Chicago & Northwestern road has its ore docks, for loading iron ore into vessels by gravity. They are built on trestles much like coal chutes. The last one built contains over 4,000,000 feet of lumber. The three docks have a water front of one and a half miles. They contain 558 pockets, which will hold 54,000 tons of ore. In the month of August there were shipped through them 270,000 tons of ore, which is equal for freight to 10,800,000 bushels of corn. These docks give employment to 175 men day and night. The night gang works by the light of 18 Brush electric lamps. From 90 to 100 loads of ore arrive daily. The road owns nearly 4,000 dump or ore cars, which are kept in repair by the road's shops at this place. They repair about 500 a month, and rebuild 25. So far this season they have built 196 new ones. The road is having 300 built by the Michigan Car Works, at Detroit. In 1867, the road built here a brick round house of 15 stalls. Last year 17 more were added, which makes the present round house two stalls more than a half circle. This season it is building a brick machine shop 80 × 292 ft. and a blacksmith and boiler shop 50 × 292 ft.; 30 ft. of the machine shop is two stories with offices up stairs and a store room and a tool room on the ground floor. Next season they will add a car shop 80 × 400 ft. The present shops employ 150 men.

Two new first-class carriages have been built as a trial by the London & Northwestern Railway Company. They are coupled together by a covered passage, and the great feature of the new arrangement is a gangway running from end to end, into which various small compartments open. At each of the two extreme ends of the coupled carriages a compartment with four seats, with two sleeping berths to draw down above them from the roof, thus affording in conjunction with the cushioned seats below sleeping accommodation for four passengers, occupies the whole breadth of the vehicle, and has a door opening into a compartment in which an attendant is in waiting. Between the two attendants' compartments a gangway runs, into which the doors of the intervening compartments for passengers open. The compartments are fitted up for four or six passengers each, and have similar, though somewhat modified arrangements for providing sleeping berths by pulling forward a couch, which, when not in use, forms part of the walls of the carriage. Each of these compartments is provided with windows and doors similar to the first-class carriages in ordinary use; but on the gangway side they open into the gangway, which in turn is provided with doors and windows opposite those of the compartments, so that the view of the passenger is not intercepted, and ventilation secured. Lavatories upon approved principles are provided, and the carriages are lighted with oil gas and heated with coal gas. The great recommendation of the new coaches is that while they give to passengers much freedom, they secure independence by being divided into a series of small compartments for four or six passengers each.

How Freight Trains are Handled.

A wildcat train used to be the dread of railroad men. Now every freight train on a great many roads is a wildcat. Yet it runs with more safety to itself and to other trains than when it used to be time-tabled. It starts out when it can, and thereafter runs or lies still on sidings under orders received at the stations.

This state of affairs has been brought about by the increasing use of and dependence on the railroad telegraph lines. But to secure safety, the telegraph must be eked out with the flag. The engineer can be communicated with only by flag or lantern. Telegraphic communication stops at the stations.

Three years ago every flagman on the Erie Railroad was summoned to the Superintendent's office, and there made to show whether or not he understood the rules of the road as to flagging trains. If it was found that he did understand them, he was allowed to go back to work after signing a statement that he understood them. It is said by road officials that this proceeding so impressed the flagmen with the importance of their duties that there has never since been an accident caused by a flagman's carelessness, such as was said to have caused the accident at Rye, on the New Haven Railroad. There are four whistle signals. One whistle, continued for about five seconds, indicates that brakes must be turned on to stop the train. Two whistles is the signal to let off the brakes. Three whistles is the signal that the train is about to be backed, and also for the flagman to go back. Whether the train is backed or not, and under any and all circumstances, the flagman must leave the caboose of a freight train or the rear car of a passenger train and hasten back three-quarters of a mile or a mile in readiness to stop any trains that may be approaching. He must stay there until he has stopped an approaching train or until he hears the signal to come back. This signal is four whistles.

When the engineer has given the signal for the flagman to come in, it by no means follows that the train must wait for him. The flagman gets back if he can. If he cannot, he must follow on the next train he can get. His flag is a pass on any train. Sometimes, when a fog lies on the Jersey meadows, an Erie train comes in with only the engineer and conductor in charge of it, every other employé having been left behind with a flag.

The signal for the flagman to go back must be given by the engineer every time the train stops, unless it be at one of its regular stations and on time. If it is not on time a flagman must be whistled back. More than this, whenever a train stops, except at a station on time, the flagman must go back, whether he hears the signal to do so or not, and he must stay there until he gets the signal to return to the train. If he does not get a signal to return, he must stay back on the track until he stops a train. The theory is, that if a flagman does his full duty, there is hardly a possibility of the crashing of one train into another. There are 130 daily passenger trains scheduled on the time tables in the Erie office. These must necessarily run according to a time schedule. Of the numerous freight trains only two are now scheduled, and it is said that this is a mere form, since it is impossible that they should run on time. The only general rule of the road as to the running of trains not carrying passengers is that right of way shall always be given to stock over all other freight.

All freight trains may be said to be run under the eye of a train dispatcher, whose business is to study the train sheet. This is a very large ruled sheet of cardboard, on which the telegraphed time at which every train on the road passes a station is put down as soon as it is received. This sheet informs him just where every train running on the road at any given time is. Some roads make their train dispatchers out of the telegraphers in the dispatcher's office. It has been the policy of the New York, Lake Erie & Western Railroad, however, to make them out of conductors, on the principle that the dispatcher ought, in case of an accident or other disturbance of the running of trains, to be able to call up to mind every inch of the road, with every switch and siding, where the long fast time stretches, and where it is impossible to make good time. He must know where to lay up an unimportant freight train, and where to stow a stock train temporarily, so that a passenger train shall lose no time, if possible, and the stock train will lose as little time as possible.

In such a juncture the dispatcher has no time to plan. All stations are notified of the disturbance, and every moment comes a statement from one of them that such or such train is there and waiting for orders. Only one brain can do the work, and a man who has not in his mind a vivid picture of the road, such as a conductor has, would find himself at a disadvantage. There is a record of the orders sent out by a dispatcher in the Erie office in case of an accident several years ago, showing that frequently during a period of eight hours the dispatcher sent out as many as three telegraphic orders a minute. The object is to keep as many of the important trains moving as possible.

In each freight caboose there is a machine which records all the movements and stoppages of the train. The revolution of an axle of the caboose moves a piece of paper, and a pencil is moved by clockwork. If the caboose stands still it records exactly at what time it stops and how long it stands, because the pencil keeps moving. If it starts, the time is recorded by a divergence in the pencil mark at a certain point upon the paper, and if it backs the paper moves backward, causing the pencil point to make a truthful record. This machine compels engineers and conductors of freight trains to perform their duty. It is not used on passenger trains, because they run by a time schedule.—*N. Y. Sun.*

New Shops of the Chicago, Milwaukee & St. Paul R. R., at Milwaukee.

This road, the numerous branches and extensions of which have been so rapidly acquired, has had a growth of traffic which is even greater in proportion than its increase of mileage. The consequent increasing demands upon the shops have been so great that their facilities have hardly been sufficient for the current repairs, and except at their North Milwaukee shops they have not been able to build any new rolling stock for some time. Last season new machine shops were built, and the old ones, including the round house, were taken to enlarge the car shops, which are still much too small, and new ones are being built near the new machine shops. The old shops, when abandoned, will be removed, and their site taken for a much-needed addition to the freight yards.

The location of the new ones is out on the river flats, about two miles from the old ones, near the Union Depot.

The switches from the main track to the new round house and shops lead past the coal sheds, which are 450 ft. long. The round house, of 44 stalls, is a complete ring, 65 ft. wide from the inner to the outer wall, and 310 ft. in extreme diameter. The turn-table in the central opening is 50 ft. long. The engines stand in the stalls with the head-lights to the outer wall, which has numerous windows, giving abundant light for working about the engines. An adjustable chimney, which hangs upon a wire rope running over pulleys, is balanced by a

weight in a box on the outer wall near the floor. This chimney has a funnel-shaped bottom end, that can be dropped down upon the smoke-stack of an engine, so that no smoke will escape into the house. These chimneys are so arranged that if an engine is pulled out without first having the chimney lifted no harm will be done to either stack or chimney.

On the side of the round house opposite the main track, are the shop buildings, all of brick, one story high and well lighted. The first one is 80 × 400 ft., with a central line of shafting the whole length; 100 ft. of the west end of this building is a wood-working and pattern shop, with seven tracks; 200 ft. of the east end is the boiler shop, with ten tracks. This shop is well supplied with tools and machinery, including a crane, a multiple drill press with four drills, a planer 18 ft. long and a Hartz & Fix machine for piecing flues. Next to the boiler shop is the tin shop about 60 ft. long. Between the tin and wood shops, in a room about 25 ft. wide, running across the building, is a drop pit worked by steam power. It stops automatically at top or bottom. In the same room is a vat for cleaning the machinery of a locomotive with lye and steam. It has a tight cover, with a pipe leading through the roof of the building.

The track from the round house leads over this pit across the transfer table and through the machine shop to the end of the blacksmith shop. The transfer pit between the building just described and the machine shop is 50 × 460 ft. The transfer table is worked by an engine and upright boiler carried upon it, which also works a windlass to move engines on and off the table.

The machine shop is 112×420 ft., having a central track the whole length, 19 pits on one side and the machinery on the other. This shop is well equipped with the latest patterns of machinery, and has an excellent tool room, which is run by the check system. All the shops and pits are heated by steam. The provision for ventilation is excellent. Fresh air is supplied from numerous covered openings outside through ventilating ducts to the steam pipes under the registers in the floor. Adjustable ventilators in the skylight provide for the escape of foul air. The shops are supplied with water from an artesian well 1,400 ft. deep, that discharges 480 gallons a minute at a pressure of 62 lbs. per square inch. With their stand-pipe only 37 ft. high, and the water continually running through the numerous cocks about the shops, they have a pressure of 8 to 10 lbs. The water pipes are laid in each pit. They use a Sellers' high pressure injector to test their boilers, with hydraulic pressure as high above the working pressure of the engine as the working pressure is above 100 lbs. After the water has run out, the boiler is filled from the shop boilers with steam of a pressure a few pounds higher than the working pressure of the boiler. All boilers are tested whenever they come into the shop, if it is more than a year since the last test. They have a small steam engine, cylinder 5½×8 in., with a governor and all complete, mounted upon small wheels. It is trundled about the shop to take the place of man power in boring cylinders, turning off valve-seats, drilling holes, etc. It is supplied with steam from pipes around the shop connecting with the stationary boiler, and its power is applied through a flexible shaft.

The blacksmith shop is 70×300 ft. and is the best ventilated shop the writer ever visited. The plan of ventilation is similar to that used in the machine shop. In the peak of the roof are adjustable ventilators the whole length of the shop for the escape of the foul air, smoke and gas. Besides the registers in the floor for the admission of fresh air, on each side of each of the pilasters for the support of the roof, which are 20 ft. apart, there is a brick chimney rising about 6 ft. from the floor, which receives air from the outside and discharges it at the top upward into the shop. These upward currents of air carry the smoke and gas of the fires out of the ventilators in the roof very quickly.

At the west end of the blacksmith shop and beside the west end of the machine shop is a storehouse for iron, 60x120 ft. Attached to the east end of the machine shop is a two-story building 40x50 ft. for the offices. Opposite this, and but a few feet distant, at right angles to the shops, is a two-story building, 50x310 ft., for a general storehouse, with the storekeeper's office at one end.

The shops are occupied to their full capacity, and already there is talk of enlarging the machine shop. They employ nearly 500 men, not including the engineers and firemen.

When the writer visited the shops, there were eighteen engines in the machine shop and five in the round house, and all except three were receiving general repairs. The boiler shop had commenced the boilers for six switching engines. They are to have four drivers, 50 in. in diameter, and no trucks, with cylinders 16 × 22 in., and are to weigh 26 tons. They will be built as fast as the current repairs will permit, and are the first locomotives which Mr. Lowry, the General Master Mechanic, has had time to build in seven years.

About 275 ft. west of the machine shop are located the new car shops which are being built. Running east and west is the transfer pit, 60 × 600 ft.; 20 ft. north of it is the paint shop, 93 × 403 ft., having 20 cross tracks; 20 ft. south of the pit is the erecting shop, 93 × 403 ft., having 20 cross tracks; 100 ft. further south is a building 80 × 353 ft., with one track running lengthwise; 100 ft. of it is the machine shop, and the rest is a blacksmith shop. At right angles to these shops, with the north end to the side of the transfer pit, is the wood-working shop, 83 × 403 ft., having two tracks running lengthwise. About 200 ft. south of the wood shops is a drying-kiln, 20 × 90 ft. A wing to the wood shop, 42 × 74 ft., is for the coal, engine and boiler rooms.

Some New Combination Cars.

A number of new combination passenger and baggage cars are in course of construction at the Jersey City shops of the New York, Lake Erie & Western road. Two of them have been completed and put into service, and are worthy of special mention as very superior specimens of this class of cars. They were designed by Mr. J. N. Mileham, the master car-builder in charge of the shops, and have been built under his supervision, their noteworthy features being an exceedingly handsome inside finish, commodious seats and large windows.

The cars are 52 feet long by 9 feet 8 inches wide over the body. The baggage compartment occupies about one-third of the length, and has closets, a stationary desk and drawers, and slatted and solid doors. The other portion has a seating capacity for 40 passengers, and is finished in solid ash, relieved with strips and moldings of cherry. The ceilings are of decorated wood corresponding with the sides. The seats and seat backs are of close woven rattan, and combine with the rest of the inside work to give to the interior a light, airy and cheerful appearance that is very agreeable. In one respect the seats are a decided improvement upon the ordinary kinds, the bottoms being of extra width, and concave in form instead of convex, the advantage of which will be readily appreciated by everybody who occupies them. The bottom frames can be easily taken out for cleaning. The windows are of 18 × 30 plate glass, and are provided with slatted blinds. The hat-racks are a new design in Eastlake style. The lighting is by six Hicks & Smith lamps, and the ventilation is well provided for. The outside is painted a maroon color. The cars are all equipped with Westinghouse brakes, Miller platforms and couplers and four-wheeled trucks, with 33-inch steel-tired wheels, and with four check-chains to each trunk. The cost of the cars is said to be about $4,200 each. In respect to careful design and skillful workmanship in every detail, they are highly creditable to the builders, and will prove a desirable acquisition to the rolling stock of the road. A hotel car is also on the stocks at these shops, which, when completed, will equal if not surpass any car of the kind that has yet been built in the country.

A Notable Private Car.

The following description of the car built for the use of the late Col. Thomas A. Scott, of the Pennsylvania Railroad, is condensed from the Philadelphia *Press*:

Car 120, of the Pennsylvania Railroad, was built years ago at the Altoona shops for Col. Scott's private use after he became an invalid. For many years it was used by him in his long journeys through the South and West, and has carried nearly all of the noted guests that have been entertained by the company's managers. Although long in service, it remains one of the finest specimens of workmanship these famous shops have produced. It runs on 6-wheel trucks, and the springs are of the finest steel and thoroughly tested. The exterior is painted in the standard red of the passenger coaches of the road, and is absolutely without ornament. The trucks are brown, and the wheels a bright green. The length of the car is 63 feet. Inside it has a drawing-room, private bedroom and bath, dining-room large enough for 10 persons to sit at the big mahogany table at the same time, and a kitchen furnished in a way that would satisfy the most exacting cook. The platform at one end of the car is 5 feet wide and inclosed by an iron railing, with seats for those who choose to sit in the shelter of the low side windows, with the scenic panorama gliding away in the wake of the train, for the President's car is always the rear one, while signals are made with the engineer by means of an electric bell. The drawing-room of the car resembles the cosy cabin of a yacht. There are books and writing-desks, as well as card-tables, while over the book-case a small French clock ticks sharply, even when the car is idle. The woodwork of the interior is black walnut, and the finishing something after the models of the Pullman cars. There are soft rugs on the floor, easy chairs near the walls. The drawing-room is lighted by eight windows, and at night by a middle cluster of four lamps overhead, with as many more on the side. The rigid simplicity of the exterior has not been carried out here, for the drawing-room is ornamented by solid mahogany and finished in silver and gold.

A door on one hand leads to the private room of President Roberts, and a smaller apartment, with sufficient room for a narrow bedstead which faces two windows in the opposite wall, while a second door leads to the bath. From the opposite side of the drawing-room a narrow passage-way leads to the dining-room, which is 25 feet long and about 10 wide, or the full width of the car. Above the carpet the finishing is partly in cherry, while the divans, extending parallel with the dining-table, are upholstered in golden plush. There are four unfolding beds overhead constructed on the Pullman pattern. In the dining-room, as in all the other apartments of the car, there are ventilators which may be opened in the opposite directions from which the car is moving, thus insuring plenty of pure air without causing a current through the car, while the fine wire netting covering the ventilators effectually guards against flying cinders and dust. A broad table with square corners stands in the middle of the dining-room, while on either side, by throwing

back the silk curtain, a view is had of the scenery without. Two folding doors opening from the dining-room lead to the kitchen, which is almost as large. It contains a pantry, a large kitchen range with an oven overhead, a broad table, wine-cooler and a smaller closet for dish-washing and other culinary operations. All that is visible to the eye in the finishing of the kitchen is solid wood like the rest of the car; the metallic work is of polished brass, after the style of modern yachts. Devoid as the car is of cumbrous furniture or unnecessary weight of any kind, it is said to be heavier than any of the other coaches belonging to the company.

A Surface Filler for Wood-Work.

When a person not familiar with the operation attempts to thoroughly fill a piece of wood, he meets with a great many difficulties in getting the surface to appear perfectly solid without a trace of grain. Indeed, until within a comparatively recent date there has been no easy and perfect method known for doing this work. If oil is used, the cells are filled by rubbing it in until a certain amount has been absorbed. A small quantity will remain in the furrows, and at first be level with the surface. As the oil dries, however, it shrinks, and ultimately there is left a series of partly-filled hollows. This accounts for the old process of applying successive coats of varnish and rubbing them down.

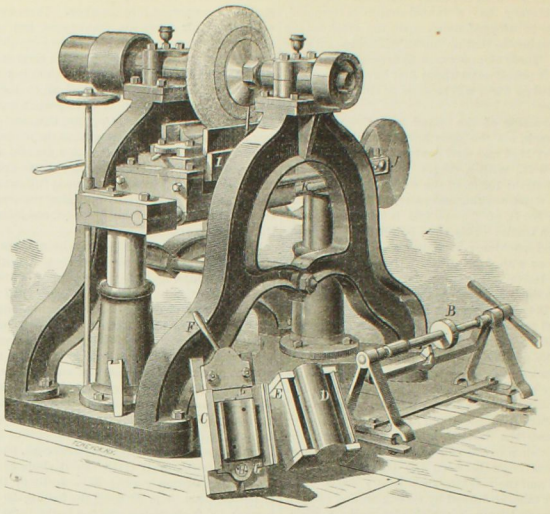
The theory was, that the varnish would ultimately fill these grooves and furrows, and by rubbing it down only so much would be removed as had adhered to the high parts. Successive varnishing and rubbing in this way consumed much time and resulted in great cost. After this preliminary work was done, the final finish had still to be applied. Accordingly much time and much money has been consumed in attempting to find a good filler, a substance which shall fill these grooves or furrows compactly and present a surface which will receive the finishing coats in a satisfactory manner. Many materials for this purpose have been employed, among which may be mentioned chalk, plaster of Paris and corn starch, all of which have been applied by mixing with oil and rubbing into the wood.

Most of these materials labor under the disadvantage of forming chemical compounds with the oil, which shrinks very much at drying, so that though the surface may appear smooth, when they are first applied, waves and hollows make their appearance as they dry.

The only material which has been found to be entirely satisfactory is ground silica, or silex as it is called in the trade. This is the material of which glass is made, and a fair result has been obtained by pulverizing, or rather reducing to powder, ordinary glass and applying it in the same general manner. The silex is mixed with oil, and in that condition probably shrinks less in drying than any other known mixture which can be used for the purpose. Silica is the basis for the best fillers now in the market.

After a good surface has been produced upon the wood-work, it is ready to receive the filler, which is to be applied and rubbed in until the surface is like so much ground glass. When the wood has reached this condition it is ready to receive the final coatings, which should be applied in the ordinary manner.—*Blacksmith and Wheelwright.*

A YOUNG nobleman in a frightful railroad accident missed his valet. One of the guards came up to him and said, "My lord, we have found your servant, but he is cut in two." "Aw, is he?" said the young man, with a Dundreary drawl, but with a trace of anxiety depicted in his countenance, "Will you be gwood enough to see in which half he has got the key of my carpet-bag?"



IMPROVED GRINDER FOR CAR JOURNAL BRASSES.

THE machine represented in the engraving is designed to supersede the use of the lathe and file, as well as of skilled labor, in the accurate fitting of car-journal brasses. This is accomplished by the use of an emery wheel, the position of which in connection with the brass is shown in the cut. These wheels are turned and kept true by a patented diamond tool, which is so arranged that it is impossible to turn by it any thing except the geometrically correct circle to which it is set. The maximum diameter of the wheels used is 20 inches, and although they may be worn down to the flange, it is claimed that they will still grind the full diameter desired, and with a speed of only 1,080 to 1,800 revolutions per minute.

The diamond tool *A* is shown in its frame, in the engraving, detached from the apparatus proper. The tool, it will be observed, swings on a center in its frame, and can be adjusted to any arc. Once set, it can only turn the prescribed arc with accuracy. In order to avoid the necessity of the foreman having to set the tool, a gauge is also furnished. This consists of a spindle adjustable with a nut in such a way that its two points rest in the centers on which the diamond tool revolves. It is only necessary for a disk *B*, turned accurately to the diameter of the bearing, to be prepared, and this the apprentice can place on the spindle, adjust the latter, and screw down the diamond tool until it touches the periphery of the disk. A nut is then fastened on the diamond tool, and the frame is lifted on the ways beneath the wheels, when the moving of the handle turns the face of the wheel to the exact circle desired.

To adjust the brass in the chuck *C* it is first set on the axle *D*. The chuck is then placed on frame *E* in such a way that the Vs fit, handle *F* then moves a cam that clamps the brass between the jaws *G*, one set of which swing on a pivot at *H*. The brass is thus adjusted in such a manner that, despite the imperfections in molding, it is ground accurately with the least removal of metal. The chuck *C* fits into planed guides on the table *I*, and is thus brought in exact line with the motion of the wheel. The crank *J* serves to move the table to and fro on the rods *K*, and the table also rises and falls on planed ways, being pressed up by springs. The hand wheel gives vertical adjustment to the whole bed by means of a chain beneath it. There is a pulley by which a suction fan, to remove dust, etc., may be driven. The machine is claimed to be capable of fitting from 150 to 500 car brasses per day.

The inventors and manufacturers are the Tanite Co., Stroudsburg, Pa., whose name has a world-wide reputation for the excellence of their emery wheels and grinding machines. The machine above described is only one of several of their own inventions that are specially designed for use in the mechanical departments of railroads.

Forcing Wheels on Shafts.

The old method of shrinking cranks, wheels, etc., to their places on shafts, or securing them by driving and keying, is now to a great extent replaced by forcing them on with a hydraulic press. The question arises, then, as to what, if any, taper should be given to the bores and axle seats.

At one of the meetings of the Master Car-Builders, this question was fully discussed. Some of the members, we believe a majority, stated that they gave a slight taper, and could not get the wheels to keep tight without it. Other members said that if the bores and shafts were parallel, with a proper allowance for forcing, the wheels remained tight, and no trouble was experienced.

Concerning the amount of this allowance, from some experiments made, it was determined that for a standard car axle the diameter of the wheel seat should be .004 larger than the wheel bore, and this would require a pressure of about 32 tons to force the wheel home.

These, we assume, are average conditions, but the smoothness of the boring and turning would have some effect in making this variable. Thus, on wheels having a bore 4⅛ diameter and 5 in. long, the axles being of steel, the rule of Mr. T. W.

Peeples, Master Mechanic of the Manhattan Elevated R. R., N. Y., is to reject wheels requiring less than about 26 tons, or more than about 35 tons to force them on. These wheels form excellent examples, because of the excessive duty to which they are subjected by reason of the frequency of their stoppage under the pressure of the vacuum brake. The practice with these wheels is to bore them parallel, finishing with a feed of $\frac{1}{4}$ inch per lathe revolution, and to turn the axle seats taper just discernible by calipers.

This may, at first sight, seem strange, but examination makes it reasonable and plain. Let a wheel having a parallel bore be forced upon a parallel axle, and then forced off again, and the bore of the wheel will be found taper to an appreciable amount, but increasing in proportion as the surface of the hole varied from a dead smoothness. In other words, varying with the depth of the tool marks in the bore, and the smoothness of the cut.

Let the length of the wheel bore be 7 inches long, and the amount allowed for forcing be .004 inch, and one end of the wheel bore will have been forced (by the time it is home on the axle) over the length of seven inches of the axle-seat, whose diameter was .004 larger than the bore. A condensation, abrasion, or smoothing of the metal must have ensued.

Now the other end of the same bore when it takes its bearing on the shaft is just iron and iron, without having suffered any condensation. If the tool marks be deep, those on one end will be smoothed down while those at the other remain practically intact. Clearly then, for a parallel hole, a shaft having as much taper as the wheel-bore will get in being forced over the shaft, best meets the requirements. Or, for a parallel shaft or seat, and a taper hole (the taper being proportioned as before), the small end of the taper hole should be first entered on the shaft, and then when home both the axle and the wheel-bore will be parallel.

It may be remarked that the wheel-seat on the axle will also be affected, which is quite true, but the axle is usually of the hardest metal and has the smoothest surface, hence it suffers but little; not an amount of any practical importance.—*Mechanical Engineer.*

English Railway Carriages.

MR. M. N. FORNEY, in a letter from England to the *Railroad Gazette*, writes as follows:

"The carriages generally have either four or six wheels, 42 in. in diameter. The Midland and the Manchester, Sheffield & Lincolnshire lines are, however, using a considerable number of double truck or 'bogie' carriages, similar to those in use in America. Possibly other lines may be using them which have not yet been visited. The general opinion of the managers who are using 'bogie' carriages, as to their relative merits, if compared with those ordinarily employed, seems to be rather undecided, or, at least, is very cautiously expressed. The following statement of the weights of a four-wheeled carriage and one with six-wheeled bogies will show their relative weights. The former is 30 ft. long over the body and has two first-class and two second-class compartments and one for luggage; it will seat 12 first-class and 20 second-class passengers, or 32 in all, and weighs 11 tons 10 cwt., or 805 lbs. per passenger. The bogie carriage is 54 ft. long over body with six wheeled trucks, has three first and four third-class compartments and one for luggage, and seats 18 first and 40 third-class passengers, or 58 in all, and weighs 23 tons, or 888 lbs. per passenger, or 83 more than the other. Some English managers, like some of their brethren in America, are inclined to assign more importance to a comparatively small excess of dead weight than is properly due to it. There has been a great deal of fallaceous reasoning about it on both sides of the Atlantic.

"Any one who will travel in the two kinds of carriages must find that the motion of the bogie cars, whatever the merits of that system may be, certainly is much easier and pleasanter than that of the four and six-wheeled carriages, notwithstanding the fact that the English roads are ordinarily kept in such excellent condition.

"The fact that a bogie carriage rides much easier than one of the European type, with four or six wheels, is indicated also by the care with which the latter is supported on its springs. These springs are of what seems to an American inordinate length, but doubtless we might imitate English practice in this respect to advantage and to the comfort of travelers. Some of the springs on the Midland road are 7 ft. long and consist of seven plates $\frac{1}{2}$ in. thick and 4 or 4$\frac{1}{2}$ in. wide. It is said on this and other roads that they rarely break, although on some of the lines the inspection of them is much more rigid than it is on many lines in America.

"Double buffers near the outside of the carriages and wagons are universally used, and so are hooks for couplings instead of draw-heads. A kind of double turn-buckle arrangement, with a screw between its two parts, is used for connecting the hooks together. When the former is attached to the hooks, the screw is turned by a weighted lever attached to it, and the buffers of the two carriages are thus drawn together and more or less compressed. On goods wagons a chain of three or four links, similar to those on some of the four-wheeled cars of the Pennsylvania coal roads, is used for coupling."

The Dirty Locomotive.

The appearance of locomotives as regards cleanliness and the brightness of their burnished parts, together with the simplicity or the "bravery" of their ornamentation, affords the traveler quite a field for small observations on railroad management. Accustomed to think of order and cleanliness as of the nearest kin, the traveler is suspicious of the dirty condition of many of the freight engines, especially on the trunk lines, and is ready to infer bad and careless management as characteristic of the whole motive department of the road. On careful inquiry, however, he will find that the accumulation of dirt on freight engines has arisen from several diverse causes. There may be a few locomotives which are dirty from mere reckless neglect, there are many more which are neglected because of an overburden of traffic on a limited motive power; and there is not a little economical neglect of dirt and rust, a sort of principled recklessness, based either on an expensive experience of overcare, or on a great scarcity of dollars and cents.

In all cases of dirty locomotives, however, neglect is to be predicated, from whatever cause it arises. The road says in very plain terms to its men: "Let the machines take care of themselves; it is not worth while keeping the property in its best condition." The dirty engine introduces into the affairs of the road a new principle, and it violates one of the oldest and strongest associations in the human mind, namely, the kinship of order and carefulness with cleanliness. It is evident, therefore, that as an economical question, the dirty locomotive involves more items than the small wages of a few wipers.

There is, however, another aspect in which the dirty locomotive may be considered. It is a moving evidence of the difficulty with which the human mind discriminates. The freight locomotive of to-day is dirty because its predecessor required so much care. The railroad mind has swung one full length of the pendulum, and already there are signs that it is about to stop and return to a more reasonable care of its motive power. In the West there has never been quite so much neglect in this respect as may now be found on several roads in the East. The new Western freight engine of the best type sheds brass bands and all ornamentation, and appears in a simple business suit of plain black. It is at once tasteful and restful to the eye, and easy to be kept in orderly tidiness. Nevertheless, it is not a universal favorite, and there are those, not however connected with the department of motive power, who would have the stripes and the bravery of their old-time favorites. No doubt this glistening bravery of brass and paint still serves a purpose in impressing the waiting public at the passenger station, watching with eager interest the approaching or departing train. The dirty passenger locomotive would certainly be a very poor stroke of economy.

In fact, it is a question whether the dirty locomotive pays anywhere or at any time—because it is dirty.

Every speck of more than needful dirt and dinginess costs the road somewhat that money cannot always, nor often, buy. Cheap and rapid transportation has changed many things, but among these, not human nature nor its old-time staple motives and close associations. Cheap transportation has not destroyed the connection between dirt and carelessness, nor between cleanliness and order, nor has it replaced the ideal element in human nature by any other. Men still need an outward expression of their inward ideal feeling toward their work.—*Railroad Gazette.*

AT the Chicago shops of the Rock Island & Pacific road 20 locomotives were built during the year ending April 1, 1881, since which 6 more have been built for the road, and 2 for the Des Moines & Fort Dodge road. They have 17x24 cylinders, 57-in. drivers, and weigh 73,200 lbs., of which 46,800 are on the drivers and 26,400 on the truck. In addition to these, 3 more of the same dimensions and weight are in process of construction, to take the place of the same number of old ones that are much lighter. One of them will have a fire-box upon the plan recommended by Mr. Jacob Johann, master mechanic of the Wabash, St. Louis & Pacific road, at Springfield, Ill., with an arched crown-sheet braced with stay-bolts instead of crown bars. The bolts have a nut and washer on the end under the sheet. The box will be 60 in. long, 33$\frac{1}{2}$ wide, and 70$\frac{5}{8}$ high at the center. The sheets are of 5-16 steel, except the flue sheet, which is $\frac{1}{2}$ an inch thick. The front flue sheet is the same, and the boiler shell $\frac{3}{8}$. These engines have the Morse balanced valve and some other peculiarities.

Engine No. 3 of this road has been in freight service since June, 1878, when it was new. It has never been in the shop since, and none of the brasses except those on the cross-heads have been taken out for refitting, and these only once. Its mileage during the three years has been 115,369 miles, and it is considered good for 50,000 more before going into the shop. Its driving wheels are 57 in. in diameter and have Krupp's steel tires. Master Mechanic Twombly gives the credit of this performance to Jerry Shea, the engineer, who is constitutionally good-natured, and never gets his engine excited. Several years ago, when much fault was found with 51-in. drivers by other engineers on account of their slipping, he took one of these engines and ran it 107,083 miles before the first turning of the tires. Another with 57-in. drivers made 120,860 miles before the first turning. But No. 3 bids fair to greatly exceed this.

Communications.

Friction of Bearing Surfaces.

To the Editor of the National Car-Builder :

Friction is the interlocking of minute projections on bearings. Under the microscope the finest cambric needle appears as rough and unfinished as a rusty piece of merchants' iron. Oil and other lubricants reduce friction because they float the surfaces apart and allow the projections to pass without touching. It follows, therefore, that an oil must be suited to the weight on the bearing —that is, it must have body enough to prevent its being forced out from between the surfaces. A light sewing-machine oil would be entirely unsuited for car axles for the above reason, while a suitable oil, owing to its heaviness and adhesiveness, would be equally unfit for light work.

When a journal cuts, it is the result of the minute projections coming into contact, like the teeth of a gear, and the stripping off of the projections is cutting. The interlocking caused by such contact leaves the surfaces in a much rougher condition than before. The projections are longer and larger, and hence the cutting progresses very rapidly after it once begins, and although more oil may be applied, it is not capable of again separating the larger projections. For heavy journals one of the best of lubricants is plumbago, which acts by filling up the depressions and thus bringing the surfaces even. White lead, as it comes from the keg, is also very effective on new or cut journals, its heavy character tending to part the surfaces. It follows, therefore, that the function of a good lubricant is to effectively separate the surfaces of bearings.

The *coefficient of friction* is that portion or percentage of the weight of a body which must be exerted to move the body. This is ascertained by dividing the weight of the body moved into the force necessary to move it. Thus, if a body weighing 160 lbs. requires a force of 40 lbs. to move it, we have $\frac{40}{160} = .25$, as the coefficient in such case. If the coefficient of friction of a body weighing 2,000 lbs. is .25, we have $2{,}000 \times .25 = 500$, as the force necessary to move the body.

The general laws of friction as applied to metallic surfaces, when such surfaces are not sufficiently loaded to produce cutting, are that the pressure alone varies it, and that it is independent of the surfaces in contact or the velocity of the surfaces. It follows, then, that a line shaft may have a box 10 or 20 inches long, equally as well as 4 inches, so far as friction is concerned, provided the surfaces are equal in both cases and the shaft perfectly straight and cylindrical. An apparent exception to this is often cited. If we take a piece of shafting, center it and place it in the centers of a lathe it revolves very easily ; but if we remove it and place it in journals it revolves much harder. It is frequently asserted that the increase of surface in the journals incites the apparent extra friction. This is not true, for the reason that when the shaft is on the centers of the lathe, we have the radius of the shaft for a *lever*, and the mass of metal outside of the center acting as a fly-wheel to keep the shaft in motion when once started. When in the journals there is no leverage, as the resistance of the journal is at the same radius as that at which we use our hands to revolve it.

It is generally supposed that Babbitt metal and brass boxes tend to reduce friction. This also is not true, as there is less friction between a wrought-iron shaft running in cast-iron boxes than in either Babbitt or brass boxes. A good steel or wrought-iron shaft, running in cast-iron boxes, will outlast the brass or Babbitt boxes. But it is frequently desirable and necessary to have the shaft suffer the least wear, in which case brass or Babbitt boxes are necessary, as these generally wear faster than cast-iron boxes do, thus allowing the wear to come on the boxes, which can be renewed at less cost than the shaft. Hence, in designing bearings the surface that can be the most cheaply renewed should be the softer. All Babbitt does not wear faster than wrought-iron or steel, as it is frequently the case that crank-pins are worn down, while the Babbitt may be seen standing out beyond the brass in the boxes. Nine times in ten this Babbitt metal is praised when it is the worst thing that can be put into the boxes, as the pin must either be renewed or turned down—a much more costly piece of work than the renewal of the boxes.

Adjustable boxes wear much faster than solid ones. Thus, on the side-rods of locomotives, when adjustable boxes are used, a great portion of the wear is due to the incessant and injudicious keying-up, the result being that the boxes are worn out and the pins badly strained. A solid box on a side-rod would last under ordinary circumstances from 18 months to two years. These boxes fitting into solid-end rods would insure a correct length of rod, and by putting the adjusting power out of the engineer's hands, would also insure a maximum of *natural* wear.

In reference to the pressure on bearings, it is customary to reduce it to the "projected area"—that is, the diameter of the journal multiplied by its length. This pressure varies greatly in different classes of bearings. A loaded freight car will average from 200 to 225 lbs. per square inch of journal, a locomotive driving axle from 200 to 250 lbs., while a locomotive cross-head or wrist-pin sustains a pressure of from 1,000 to 1,500 lbs. per square inch. The little trouble locomotive crank-pins give is quite remarkable, considering the high pressures to which they are subjected. The limit, however, is sometimes very closely approached. An engine pulling passenger trains on a certain road always had hot pins when climbing long grades, while they cooled off when running down grade. The heating was done away with by using new pins, with an increased diameter of only $\frac{1}{8}$ of an inch. I would give the pressure per square inch, but unfortunately have forgotten the dimensions of the pins. The change of motion at each revolution, as occurs in the main rod, etc., allowing fresh oil to find its way between the faces of the bearings, may have something to do with the successful working of crank-pins.

One of the latest and best treatises on friction is Professor Thurston's "Friction and Lubrication."

FRANK C. SMITH, M. E.

Car Inspection.

To the Editor of the National Car-Builder :

Master car-builders, as well as the higher grades of railroad officials, are presumed to understand the importance of efficient car inspection, yet it must be manifest to any intelligent observer of the manner in which this service is performed that one very essential feature of it is grossly neglected. Almost everybody knows the practical value of an "ounce of prevention," and in these days, when it is no easy thing to get seasoned lumber for new cars, the familiar adage has a peculiar force. As freight cars are usually built, the least shrinkage of plates, sills or posts, loosens the braces and trusses, and although this can be prevented by the tightening of tie-rods, the remedy is seldom or never resorted to until the car is actually broken, and it may be in consequence of this very neglect. As soon as the braces become loose there is more or less motion at the joints, which increases the looseness, and it is no wonder the framing sags and breaks. The inspectors are apt to look only for breakages; and so long as none are apparent, the cars are allowed to keep running without regard to their condition in other respects. There ought to be special provision for tightening up all new cars the second month in the summer and the third month in winter, after they are turned out of the shop; and after that, every freight car should be inspected and tightened up in the same way at least once a year, and so thoroughly that every brace, nut and washer will have a firm bearing. No pressure of business should be allowed to prevent such inspection. There can be no question as to its economy, as it would consume less time and cause less detention than to repair the inevitable breakages that would occur if it is not done.

NELSON.

Railway Master Mechanics.

To the Editor of the National Car-Builder :

It may well be doubted whether there is any class of men in this country whose influence is so great in their respective spheres, and who are at the same time so undeservedly overestimated, as railway master mechanics. In most other professions and pursuits in which a certain amount of technical knowledge is necessary, as well as a knowledge of fundamental principles, a preliminary course of study is deemed indispensable. That the advantages of such a preparatory course are not as a rule possessed by the class referred to, is due to the fact that the railway system has been developed too rapidly to allow of the requisite technical training to meet the emergency.

Ask the average master mechanic of to-day why the frame of a locomotive is made of a particular size, why a smaller size would not do as well, or how he would determine the size of a frame for a larger or smaller engine, and the chances are that we should hear some pretty tall guessing. Or, if we ask an average master car-builder the same questions with respect to a car sill, there will in all probability be the same kind of guessing. But if a civil engineer is asked how he gets the size of a compression member or a tie in a bridge, he at once begins to figure, and the result will be pretty sure to stand fire, because his calculations are based on a knowledge of elementary principles. When a new engine is to be built, the master mechanic not unfrequently casts about to see what others have done, or are doing, or he follows the directions of his superior officers, who know little or nothing about mechanics or motive power. If a tender truck is to be made, does he go to work and determine the strains the truck must bear, and proportion the parts accordingly, basing his calculations on a knowledge of the strength of the material, and the strains to which it must be subjected? Perhaps so. Or, he may call his draughtsman and request him to run over to the X Y Z shops, take a good look at *their* tender-trucks, and get up a drawing just like them.

The directors of a road want a new passenger engine built that will pull the new Salt River express train at the rate of 50 miles an hour. Does the master mechanic in such a case take from the shelf a few select authorities on locomotive engineering and demonstrate that the resistance increases as the square of the speed, and make calculations for a proportional increase of cylinder and boiler power? Does he estimate the tractive force of the new engine, and know beforehand whether it is possible for it to perform the work? Or, does he tell his draughtsman to get out the drawings for a new engine, say 17 × 24 cylinders, boiler 50 or 54 inch shell with plenty of flues, $5\frac{1}{2}$ foot drivers with 6 inches more spread than for a 51 inch boiler, and a good valve motion? However this may be, the engine is built and makes her trial trip; but when she gets down to regular duty it is found that the express train pulls too hard, or that the track is in bad condition, or something of

the kind. Any way, she never makes the 50 miles an hour.

This, I aver, is no exaggeration, nor is it surprising when it is considered that there is no standard or course of preparatory study, and but little opportunity for master mechanics to learn what is being done in other shops than their own. When new and strange conditions arise, the lack of technical knowledge leaves no alternative but to copy, if there is anything to copy from, or else resort to guessing. In marine and first-class stationary engine work every part is subjected to the most careful analysis and is correctly proportioned. The American locomotive, as a type, has been perfected by our large contract shops, where the best talent is brought into requisition. The fact is that four-fifths of the improvements in locomotive and car work originate with outsiders, who are in no way connected with railroads. One manifest drawback to the efficiency of master mechanics and car-builders is that they are subordinate to higher grades of officials who are not mechanical men, and who expect the heads of car and locomotive departments to become accomplished experts in their position by simply learning the machinist trade, then becoming a gang boss and then a foreman.

What is wanted in this country is a school where young men, after learning in a railroad shop as much as an average foreman knows, can enter and receive a mathematical and technical topping off. Then we may look, not only for an improvement in the economy of the American locomotive, but an increase of the power, capacity, remuneration and responsibility of railway master mechanics. SUTHERLAND.

Patching Locomotive Cylinders.

To the Editor of the National Car-Builder:

Locomotive cylinders are frequently broken in such a manner as to allow of being patched, which, if well performed, renders them practically as good as ever. Considerable skill is sometimes necessary in this class of repairs, and especially when the fracture involves the port.

In Fig. 1 is shown a broken cylinder, the edge of the break having been chipped-and-filled beveling, as shown at *a a*. A piece of sheet iron is then bent to the circle of the cylinder inside, and placed in it so as to prevent the plaster of Paris which is

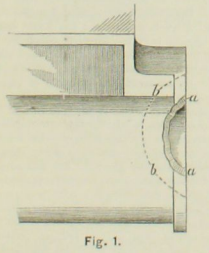


Fig. 1.

used from falling into the cylinder. A simple thick mixture of plaster of Paris and water is frequently used, although the addition of one-third of marble dust toughens the mixture and delays the "setting"—this latter feature being desirable. The surfaces of the break and side of cylinder being well oiled, and the sheet iron in place in the cylinder, the plaster of Paris may be piled on and worked down on to the surfaces to insure contact and absence of air-holes, the mass extending to the dotted line *b b*. When it is set sufficiently, it may be reduced to shape with a wet knife. The thickness of the patch where the rivets are placed is usually from $\frac{1}{2}$ to $\frac{5}{8}$ of an inch. When completely set, the plaster pattern may be removed from the cylinder and retouched with a file. It may then receive a coat of varnish, and a brass casting be made from it, which should be soft enough to allow of being caulked. The joint at the fracture between the patch and cylinder need not be a "scraped joint" a fair, ordinary touching of the surfaces being sufficient. The writer has seen lugs cast on to the patch to allow of the insertion of set-screws *d d*, as shown in Fig. 2, in order to force the faces of the

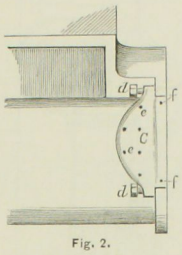


Fig. 2.

joint together. Brass rivets *e e* are inserted, and well countersunk both inside and outside. The patch is frequently allowd to extend past the fracture on the cylinder flange to allow of rivets *f f*, as shown.

After the patch is riveted into place the edge of the patch in the bore of the cylinder is caulked against the cylinder, when the patch needs only to be bored out. Fitting a wooden pattern, in place of the plaster of Paris, is frequently resorted to, but has the drawback of taking more time, and at the best, of being a far less accurate pattern.

Fig. 3 shows a portion of a valve seat with a brass patch *b*, when for any reason a patch is necessary.

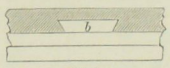


Fig. 3.

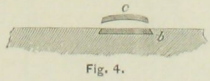


Fig. 4.

The ends of the patch are dovetailed both ways, as shown in Figs. 3 and 4. A brass patch is then got out and made the same length as the cavity in the seat. It is then bent a trifle, as shown at *c*, so as to allow of its being placed in the seat, and then straightened out in position. This of course locks the patch in. A couple of rivets may be inserted, but if the job is well performed, the rivets will not be necessary. FRANK C. SMITH, M. E.

Standard Freight Cars of a Southern Road.

To the Editor of the National Car-Builder:

The fact is paraded in some of the railway journals that a northern road, the name of which I cannot now recall, is building box freight cars 33 feet long, and with a capacity of 40,000 pounds, as if this was something extraordinary. Why, down here in Georgia 33-foot box cars are an old story. This has been the standard length for box and flat cars built for the Georgia Central road for many years past. I wish some of the Northern and Western builders could see them, and the trucks we put under them to carry 20 tons of freight. They are the lightest cars of that capacity that I ever saw or heard of. The axle journals are 4 × 8 inches, which I think is the largest car journal in use in this or any other country, and I have yet to hear of one of them getting hot—a fact that is mainly due to the increased area of bearing surface, which reduces the liability to heat to a minimum. When this size was adopted by the road, I was in favor of increasing the length to 10 inches. What a grand bearing that would be for the present 20-ton loads, to say nothing of still heavier ones that will soon be in fashion! The old idea that an increase of journal bearing surface increases friction and makes cars pull harder is pretty thoroughly exploded.

K. K.

[We wish our correspondent had stated what these cars weigh, and then the proportion of dead weight to capacity could be compared with the claims of other builders. In regard to 4 × 8 journals, we believe the Philadelphia & Reading road used journals of this size on its 8-wheel coal cars ten years ago, and still continues to do so; but when the few advocates of this size urged its adoption for the "standard" axle at the meeting of the Car-Builders' Association in 1873, they were thought to be more visionary than progressive, and so a compromise was made on 3¾ × 7, a size which already begins to look small.—ED. CAR-BUILDER.]

The Rigby Car Wheel.

This newly invented wheel is thus described by the inventor: The hub, spokes, rim and side plates are cast in one piece, and answer to the unchilled portions of the common cast wheel. The tire and flange, in separate pieces, are of steel, making a wheel of three distinct pieces. The cast-iron portion is made of the toughest iron and left in its natural state. The outer rim is turned to true surface, perfectly round; the tire made of the best character of steel, with its inward and outward surface turned to a true circle, and shrunk to its place on the outer rim of the cast-iron portion. This tire is two inches thick, having a lateral bearing on the outside against the side plate, which projects to within three-fourths of one inch of the top of the tire. The flange, also of steel, rests upon the edge of the inner side plate, with absolutely true joints, both on the plate, cast rim and tire, and held to its place with sixteen seven-sixteenth inch cold drawn iron bolts passing through from plate to plate, with strong, heavy threaded nuts and riveted. The tire is a trifle wider at the bottom than at the top, and is held by the flange and outer side plate as in dovetail, and consequently cannot get out of place. Even should the tire for any cause become broken, no piece can get away from its place without breaking its lateral bearings—a thing not likely to be done.

THE car works of Pardee, Snyder & Co., at Watsontown, Pa., are being enlarged by an addition to the wood-working shop 50 by 60 ft. The blacksmith shop has been nearly doubled in size.

THE machine shops of the Chicago, Milwaukee & Saint Paul Railroad, in Minneapolis, are to be torn down and built elsewhere, to make room for the proposed mammoth one million bushel capacity elevator.

THE Pennsylvania Railroad is building a patent car at the Altoona shops for the transportation of fast horses and sulkies. One end of the car contains compartments for four horses, and the rest of the car is to be used for sulkies, harness, etc. The new sporting stock car is intended to be attached to passenger trains, so that grooms and stock can travel from point to point with more raeidity than by ordinary freight trains. Should this car prove satisfactory, others of the same kind will be built.

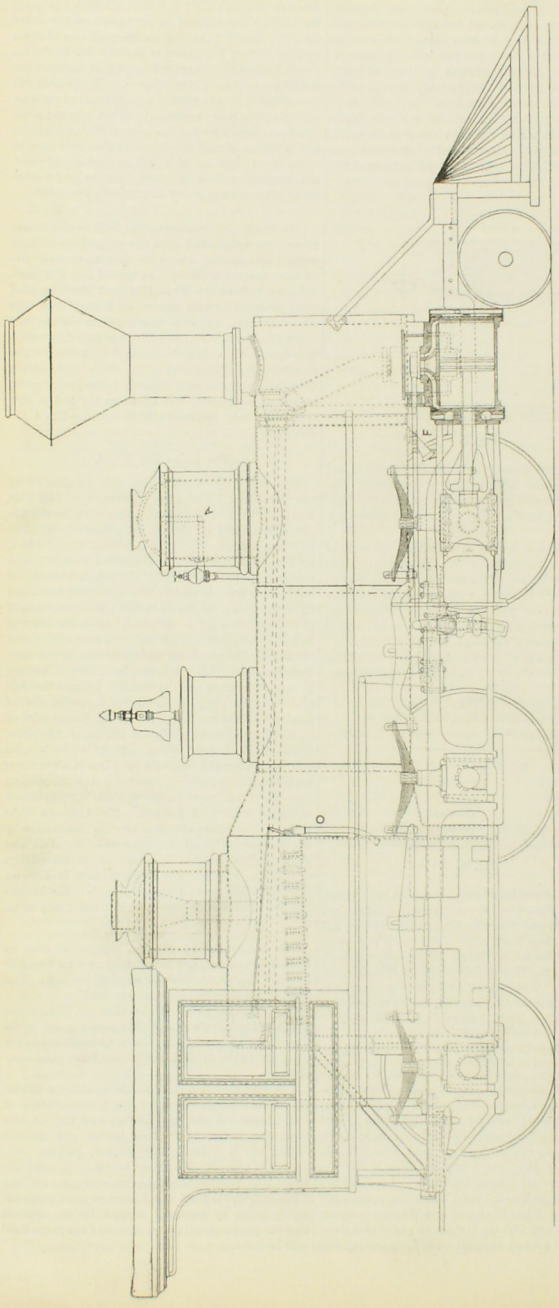


FIG. 1.—STANDARD MOGUL LOCOMOTIVE—ILLINOIS CENTRAL RAILROAD.

THE engravings illustrate the Standard Mogul Locomotive of the Illinois Central Railroad, built in 1881, at their Weldon shops, Chicago, Ill. Its principal dimensions are as follows:

Boiler, smallest outside diameter	50 in.
No. of tubes	179
Diameter of tubes	2 in.
Length "	11 ft. 5⅛ in.
Fire-box, inside	65×34⅝×65⅛ in.
Square feet of grate surface	15½
" " heating surface of fire-box	104
" " " " tubes	1,061
Total square feet of heating surface	1,165
Cylinder, diameter and stroke	18×24 in.
Driving wheels, diameter of	4 ft. 8 in.
Truck wheels, "	2 ft. 6 in.
Driving wheel base	15 ft. 6 in.
Total wheel base	22 ft. 11 in.
Journal of driving axle	7×7½ in.
Weight on driving wheels	68,000 lbs.
" on truck	18,000 lbs.
Total weight of engine in working order	86,000 lbs.
Capacity of tank, water	2,500 gals.
" " coal	4 tons.
Total weight of tank in working order	46,590 lbs.
" " engine and tank in working order	132,590 lbs.

PREVENTION OF INCRUSTATION.

The incrustation of boilers by the bad water, which is the best many of the railroads can get, has made the construction of locomotive boilers so as to secure good service from them while using such water a problem of great interest to most master mechanics. This locomotive has several attachments and peculiar features that originated in the Weldon shops, some of which are especially designed to prevent incrustation and keep the boiler clean.

The first device for this purpose was a filter and lime-catcher, which takes advantage of the well-known facts, that water when heated to a high temperature deposits its lime, and that lime has a great affinity for iron. The filter, shown at *A*, Figs. 1 and 4, consists of a dome filled with small pieces of broken scrap iron, supported by a perforated plate *B*. The feed water is received through a double check *C* and pipe *D*, into the top of the dome, where it is met and heated by the steam from the boiler sufficiently to cause it to deposit the lime as it trickles through the heated scrap into the boiler. The deflectors *E E* prevent the sediment in the water from falling on the dry pipe and flues on its way to the bottom of the boiler, where it collects ready to be washed out.

This is done by the use of their next attachment, shown at *F*, in Fig. 1. In Fig. 3, the upper engraving is a part plan, the middle one a front elevation, and the lower one a vertical section of this wash-pipe. The brass fixture *F* is secured to the boiler shell *H* by four rivets. It has a hose coupling thread at the outer end, and a cap *I* when not in use; the inner end *J* has a narrow opening ¼×3 in., through which the water is delivered in a much better way than from a hose nozzle. This wash-pipe is placed as near as possible to front flue sheet *K*. Its use avoids the necessity of removing the petticoat pipe and the flue sheet plug.

Their next attempt was to find a method of removing the sediment which is left on the crown-sheet by the rapid evaporation of water from over the fire-box, that would be more efficient and convenient than using a hose through the dome opening. For this purpose they constructed the crown-sheet washer represented in Fig. 5, which gives a side elevation with a portion of the boiler removed to show a section through flues, crown-sheet and crown-bars, and the position of the washer in relation to them; and also a vertical section at the location of washer in front of fire-box flue-sheet, showing the relation of the holes *L*, in pipe *M*, to the crown-bars and bolts. This pipe extends across the boiler, the inner end being closed, and it has oblong holes *L*, opposite all the spaces between the rows of crown-bolts. The check *N* is provided with a pipe *O*, having a hose attachment at the end. This pipe *O* is carried through the running-board to any place convenient for attaching the hose, and to be used as a discharge pipe. The valve stem *P* of the check *N* has a bell-crank *Q* connecting with the rod *R*, which extends to the cab, enabling the engineer to use this arrangement as a surface cock to prevent priming, foaming or excess of water in the boiler.

Their method of washing the boiler, which experience has shown to be the best, is as follows: The hose from

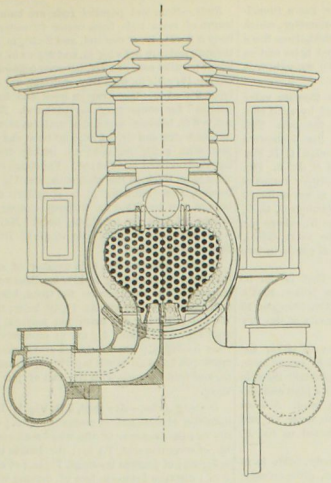


Fig. 2.—Front Elevation and Section.

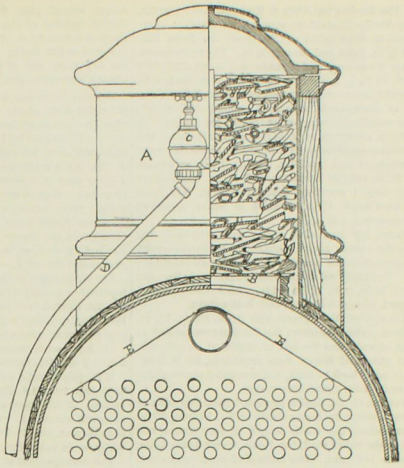


Fig. 4.—Filter and Lime-Catcher.

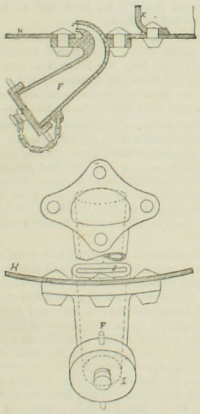


Fig. 3.—Front Wash Pipe.

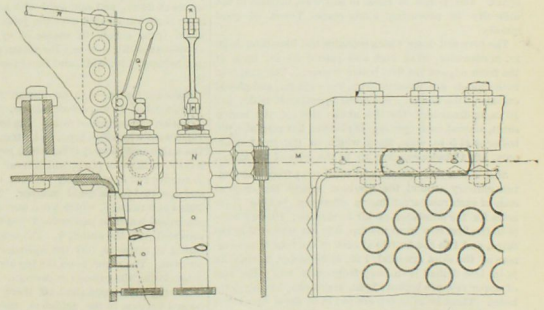


Fig. 5.—Crown Sheet Washer and Surface Cock.

the force pump is attached to pipe *O* of crown-sheet washer while the globe cock in the dome is blowing off the steam, and water is immediately pumped in until the boiler is full, which gradually cools off the water and boiler and prevents the sediment from settling and hardening. Without stopping the pump, the hand-hole plates are removed and the pressure of the force pump increased to from 80 to 100 lbs., and the water is forced over the crown-sheet through the openings in crown-sheet washer until the crown-sheet is sufficiently washed, when the hose is removed to the front wash-pipe *F*, and the waist of boiler cleaned. This continual injection of water under pressure while the boiler is being emptied, keeps the mud and sediment in constant circulation until it runs out. Frequently when a boiler needs cleaning and there is not time to cool it off, the injectors or pumps are kept working, and the crown-sheet washers draw off the surplus until the water is changed. An engine just out of the shop, which brought in a train of three passenger cars with difficulty, was blown out in this way without cooling her fire, and in three-quarters of an hour after coming in took out a train of eleven passenger cars with ease. One of their orders to engineers is to use the crown-sheet washer as a surface cock once an hour while the engine is working, and whenever there is foaming or priming.

These improvements are of too recent date to have demonstrated their full value, but their use has reduced the cost of boiler repairs more than 50 per cent., besides increasing their durability and securing a saving in the amount of coal burned per car mile. The first engine to which the filter was applied made a mileage in Illinois of 99,464 miles in three years before the flues were removed. On the Iowa division, which has the worst water, the average time between the removal of more or less of the flues to clean the boiler was 7½ months in 1879, before the application of any of these improvements. In May and June, 1880, three heavy Moguls, and in October, three more, all having these improvements, were put in service on this division. These engines have run from 10 to 14 months without giving any trouble from sediment, and the boilers are in good condition.

The Filter, Crown-sheet Washer, Cylinder Cock and Throttle Valve used in this locomotive are patented. Further information in regard to them may be obtained of S. J. Hayes, Supt. of Machinery, Illinois Central R. R., Chicago, Ill.

DETAILED DESCRIPTION.

Fire-box.—Is of Otis steel $\frac{7}{16}$ in. thick, except the flue-sheet, which is $\frac{7}{16}$ in. The inside dimensions are: width at bottom, 34⅝ in.; at top, 43¾ in.; length, 65 in.; height at front, 65½ in.; at back, 63½ in.; the crown-sheet having a slope of 2 in. The fire-door opening is 13 × 17⅝ in. oval, formed by flanging both sheets outward and connecting them by a ring made of the same steel, as shown in fig. 1. The water spaces are 3½ in. on the sides and back, and 4 in. on the front, and formed by a wrought-iron ring of 2¼ in. iron between box and shell. All rivets in fire-box are ⅝ in. in diameter and 1⅜ in. apart from center to center. Five braces from the flue-sheet extend to the boiler-sheet in the usual way, except that the rivets have thimbles 1 in. long made of ¼-in. iron, between the crow-feet and the flue-

sheet. The fire-box has Allen & Hudson's shaking grate.

Boiler Shell.—(Except the smoke-arch which is charcoal iron) is constructed of Otis steel; the front flue-sheet is $\frac{7}{16}$ in. thick and the rest $\frac{5}{16}$ in. The main dimensions are: From front end of smoke-box to out of fire-box forward, 14 ft. $\frac{1}{2}$ in.; length out to out of fire-box, 6 ft. 2 in.; width out to out of fire-box at bottom, 3 ft. $6\frac{3}{4}$ in.; length of smoke-arch, measured outside, 2 ft. $8\frac{1}{2}$ in.; smallest outside diameter of barrel, 50 in.; wagon-top raises 10 in. above sheet of barrel next adjoining, and the bottom connection-sheet lowers 3 in. below the same. Total height of back head 7 ft. $5\frac{3}{4}$ in. Dome on wagon-top of 26 in. outside diameter, and 26 in. high above shell of boiler; center of dome to be 3 ft. 8 in. from face of back head. Greatest width of boiler, measured over wagon-top, 4 ft. $4\frac{1}{4}$ in.

All holes for horizontal seams and stay-bolts are drilled; the others are punched. The horizontal seams in connection-sheets are double riveted; all others are single. Covering all horizontal seams in boiler are welts of $\frac{5}{8}$-in. iron, 12 in. wide, with 4 rows of rivets, 5 in. apart, zigzag, 3 rows in each boiler-sheet.

Shell is riveted throughout with $\frac{3}{4}$-in. rivets, $1\frac{5}{8}$ in. apart from center to center; the flat surfaces formed at junction of waist and fire-box are stiffened on each side by four pieces of heavy 3-in. angle-iron, 36 in. long, placed in pairs back to back, and connected across above the tubes by 1-in. round iron braces.

The bottom of the shell is protected from corrosion or mechanical action by lining sheets of No. 10 iron, 30 in. wide, extending the whole length of each course, and riveted to the boiler shell, the joints under them being filled with red lead. This method of construction prevents the pitting of the steel sheets, and thereby greatly increases their durability.

Entirely across the flat surface of the boiler-head, just above the crown-sheet, is placed a T-iron, formed by putting 2 pieces of heavy 3 in. angle-iron together, which is fastened to the shell with $\frac{3}{4}$-in. rivets, 6 in. apart. The T-iron is made in this way, because of the difficulty in procuring ready-made T-iron of good quality.

The forward dome which contains the lime-filter is 26 in. in diameter, 30 in. high and placed 37 in. back of the front edge of the first boiler course. The rings of both domes are wrought-iron, $2\frac{1}{8} \times 2\frac{3}{4}$ in., and placed outside of the domes. The dome openings in boiler are 16 in. in diameter. On the under side of the boiler-sheet, around each opening, is placed a flat ring of $\frac{5}{8}$-in. boiler steel 5 in. wide, from which, in the front dome only, are 4 braces running up to the sides of the dome.

Stay-Bolts.—The second and third rows from the bottom entirely around the fire-box, except the ones at ends of each row, are 1 in. in diameter, having $\frac{7}{8}$-in. holes for the admission of air to the fire; 10 stay-bolts (4 in the first row from the top, 3 in the second, 2 in the third, and 1 in the fourth) at each of the four upper corners of the sides are solid, 1 in. in diameter, having an $\frac{3}{8}$-in. hole drilled $\frac{1}{2}$ in. deep from outer end; the rest of upper row are hollow, $\frac{5}{8}$-in. stay-bolts, having $\frac{7}{16}$-in. holes. These holes at top are put in to show breakages by leaking. All other stay-bolts are $\frac{5}{8}$ in. in diameter and solid. Across the boiler, between the crown-bars, are two rows of $\frac{5}{8}$-in. long stay-bolts, the under side of the lower row being even with the bottom edge of the crown-bars, and the top row $4\frac{1}{4}$ in. from center to center above the other. All stay-bolts are of the best Ulster iron, and placed $4\frac{1}{2}$ in. apart, horizontally, and $4\frac{1}{4}$ in., vertically, between centers. All holes for stay-bolts are drilled.

Crown-Bars.—Are 12 in number, made of two bars of $\frac{5}{8} \times 4$ in. iron, welded in pairs at each end with an inch piece between, having $2\frac{1}{4}$-in. bearings on side sheets. There are nine $\frac{5}{8}$-in. bolts with square heads to each bar; each bolt has between head and crown-bar a $\frac{5}{8}$-in. washer $2 \times 3\frac{1}{4}$-in., with a lip turned down over each side of the crown-bar to prevent their spreading, and is tapped into the crown-sheet, and has on the under side a $\frac{5}{8}$-in. nut, $\frac{3}{4}$-in. thick, all as shown in Fig. 5. In screwing in bolts great care is taken to keep the crown-sheet straight and of uniform tension. The spaces between crown-bars and crown-sheet are $1\frac{1}{2}$ in. high, with no washers on any bolts. The crown-sheet is braced to wagon-top and dome in the usual way.

Steam Pipes.—Are oval, $4\frac{1}{2} \times 6$ in. inside, with ball-joint connection to cylinder and throttle box. The dry pipe is of wrought iron, lap-welded, 6 in. outside diameter, with ball-joint on front end and cast-iron shoe with brass stuffing box on back end at the boiler head. The copper branch pipe, 6 in. in diameter, has a funnel-shaped opening at the top 12. in. in diameter, which reaches within 10 in. of the dome cap; the bottom has a cast-iron saddle fitting on to a perforated brass seat on the dry pipe, and is held to it by two wrought-iron clamps with set screws.

Throttle Valve.—A horizontal balance throttle valve is located in the smoke-arch and operated by a rod running directly to an eccentric lever in the cab. This valve is illustrated by Figs. 6, 7 and 8. Fig. 6 shows a front half elevation and half section through *C D*, Fig. 7. Fig. 8 is a vertical section through *A B*, fig. 6. Fig. 7 gives plan and elevation of valve proper removed from box. Except the openings *G*, it is an ordinary poppet valve, having seats *E F*. The openings *G, G, G, G*, admit steam from boiler to cavity *H*, where the pressure on the larger seat *E* keeps the valve closed. The rod *I* is secured to valve by die *K* (made in two pieces) and the nut L.

The advantages of this throttle are: That it can be repaired or ground without opening the boiler; that a throttle located near the cylinders is better than one in the dome, and that it gives the full capacity of the dry pipe in a small compass.

The box can be made to take the place of either the flat or V throttle valve usually located in smoke-arch.

With this throttle valve is used the eccentric throttle lever represented in Fig. 9, which shows a plan and elevation. *M* is a brace attached to boiler head. *N* is an eccentric secured to and moved by the lever *O*, and both turn on pin *P*. The strap *Q* is fastened to rod *R*, which leads to the throttle valve.

This arrangement moves the valve easily, holds it in any position without fastening the lever, gives an easy, regular and positive movement to the valve, and permits a gradual admission of steam to the cylinders, that enables an engineer to start a passenger train without any jerk or jar.

Cylinders.—Are 18 in. in diameter and made for a stroke of 24 in., and cast solid with half of the bed-castings; their total length over the joint is 31 in.; the distance from center to center of cylinders, 7 ft. The valve-seat is $12\frac{1}{4} \times 17$ in.; the steam ports are $1\frac{1}{4} \times 15$ in.; bridges, 1 in. wide, and the exhaust port $2\frac{1}{2}$ x 15 in.

Cylinder Cocks.—Are an improved pattern, being a valve worked by an eccentric lever. Fig. 10 shows an elevation and section of same. The brass valve *a* is provided with wings *b* on top, *c* on bottom and a steel stem *d*. The valve seat piece *e*, is forked to receive an eccentric lever *f*, with pivot pin *g*, which lever in turn is forked to receive rod *h*, extending to both cocks on cylinder and operated in the usual manner. The seat *e*, is inserted in a casing *i*, which has a cavity *j*, to allow the condensed water to pass around head of valve, and is provided with the outlet, *k*. The length and size of this casing is made to suit the cylinder into which it is screwed. The wings *b*, on the top are to keep the valve from closing the passage in casing *i*. When the engine is moving with steam shut off there is a tendency to form a vacuum in the cylinders, then the valves will raise automatically and by admitting air destroy the vacuum and thus tend to prevent sparks from being drawn in through the exhaust ports. These cocks are cheap in construction and repairs, the valves being the only parts that require renewing.

Pistons.—Are made in one piece $4\frac{3}{4}$ in. wide, cored out to lighten them, and provided with two expansion rings $\frac{5}{8} \times \frac{3}{4}$ in. Piston-rod is of steel, 3 ft. $2\frac{5}{8}$ in. long between shoulders and 3 in. in diameter, with a taper fit and shoulder in cross-head, secured with a steel key $\frac{1}{2} \times 2$ in.; piston is put on with a taper fit and nut with end of rod riveted over. Jerome patent packing is used on all piston-rods and valve-stems.

Guides.—Are of iron, case-hardened, two on each side, one above the other, 4 ft. $10\frac{1}{2}$ in. long, $4\frac{1}{4}$ in. wide, 3 in. thick in the middle and 2 in. at the ends, and secured to the back cylinder-head by guide-blocks $3\frac{1}{4}$ in. long, and to the guide-yoke by bolts through the feet on end of guides.

Guide-Yoke.—Is of wrought iron, varying from $5\frac{1}{8}$ to $7\frac{1}{8}$ in. wide and $1\frac{1}{2}$ in. thick; made in one piece running across the frames and fastened to them by wrought-iron brackets.

Cross-Heads.—Each consists of a cast-steel hub or center which receives the piston-rod, inclosed by two wrought-iron plates, between the edges of which are bolted two cast-iron bars to carry the brass gibs, which are 19 in. long and same width as guides.

Rods.—Main and parallel rods are hammered iron; length of main rods from center to center is 7 ft.; the body is $2 \times 4\frac{1}{2}$ in. at one end, and $2 \times 3\frac{1}{2}$ in. at the other; the stub ends are $3\frac{1}{2} \times 5\frac{1}{4}$ in. and $2\frac{5}{8} \times 4$ in. respectively. Front parallel rods are 7 ft. between centers, of uniform section, $1\frac{5}{8} \times 3\frac{1}{2}$ in. with back stub end, $2\frac{5}{8} \times 5\frac{3}{4}$ in., and front $2\frac{5}{8} \times 4$ in.; the strap on back end has a "spade handle" for connecting the back rod. Back parallel rod is 8 ft. between centers, of uniform section, $1\frac{5}{8} \times 3\frac{1}{4}$ in.; back stub end $2\frac{5}{8} \times 4$ in., and front end has a forked jaw with a $2\frac{1}{4}$ in. steel pin fitting dies in "spade handle" on front parallel rod. The straps on all the rods are $1\frac{1}{2}$ in. thick on the stub ends, and $1\frac{1}{4}$ in. front of brasses, thus allowing $\frac{1}{8}$ in. shoulder, so that new brasses can be fitted in without closing the straps. Straps all held by two $\frac{7}{8}$-in. bolts. Main rods have single keys, and parallel rods single at front end and double at the other.

Driving Wheels.—Are 6 in number, of cast-iron centers tapering from $50\frac{1}{4}$ to $49\frac{5}{8}$ in. diameter, with steel tires of $3\frac{1}{4}$ in. thickness on the tread, bored to fit centers and held on by twelve $1\frac{1}{4}$-in. bolts; the length of the hub is $7\frac{1}{4}$ in.; the main pin journals are for main rods $4\frac{1}{4}$ in. long and $4\frac{1}{4}$ in. in diameter, for parallel rods $5 \times 3\frac{1}{2}$ in.; front and back crank-pins are 3×3 in.; crank-pin holes are bored tapering $\frac{1}{4}$ in. and pins ground in, and held by nuts with the end of pin riveted over them.

Driving Axles.—Are steel, 5 ft. $9\frac{1}{2}$ in. long over all; diameter of main axle at center is $6\frac{5}{8}$ in.; of the others, $6\frac{1}{2}$ in.; the diameter of the wheel seat and journal is 7 in., of eccentric seat, $7\frac{1}{8}$ in.; the length of wheel seat is $7\frac{1}{4}$ in.; of journal bearings, $7\frac{1}{2}$ in.; of eccentric seat, 9 in.; distance between face of driving-wheel hubs is 4 ft. 6 in.; over hubs, 5 ft. $8\frac{1}{2}$ in.

Driving Boxes.—Are cast iron, with 5 brass gibs cast in, as shown in Fig. 1. These gibs extend the entire width of the boxes and are 2 in. wide; the center one is $1\frac{5}{8}$ in. thick, and the others 1 in.; Babbit metal is run in between them $\frac{5}{8}$ in. thick, and all bored 7 in. in diameter to fit journals.

Frames.—Are of the best hammered iron; each frame is composed of two parts bolted together; the upper part is $4\frac{3}{4}$ in. deep, the lower 2 in. and the forward part $4\frac{3}{4}$ in.; the width throughout is $3\frac{1}{4}$ in. The pedestals are made for one stationary shoe, and one movable wedge, the latter on the backward side.

Carrying Gear.—Equalizers are hammered wrought iron, pivoted on a steel key fitted into a wrought-iron stand attached to the frame. Driving springs are made of 12 leaves of $\frac{5}{8} \times 3$ in. steel, and measure 34 in. from center to center of spring hangers. Expansion buckles are wrought iron, 18 in. wide and $\frac{1}{2}$ in. thick, fitted to the frames and secured to side of fire-box by twelve $\frac{3}{4}$-in. studs in each buckle, 6 above and 6 below the frame.

Valve Motion is the shifting link motion. The skeleton links, slide-blocks, saddles and pins are of hammered iron and case-hardened; the rocker-arms are of cast steel; the lifters, the lifting shaft and eccentric blades, are of hammered iron; all holes and bearing-pins have steel bushings; the eccentrics are solid, have 5 in. throw and are secured to the shaft by two $\frac{3}{4}$-in. steel set-screws and one taper-fluted steel key. The valves are 17 in. long, $8\frac{1}{2}$ in. wide; the inside cavity, 15 in. long and $4\frac{3}{8}$ in. wide; have $\frac{3}{4}$-in. outside and $\frac{7}{16}$-in. inside lap and 5-in. travel at full link; the face of the links, $2\frac{1}{2}$ in. wide. Distance from center to center of blade-pins is $11\frac{1}{8}$ in.; radius of link, $50\frac{1}{2}$ in.; extreme length of link, $22\frac{1}{2}$ in.; length of rocker-arm, 10 in.; lifter, $14\frac{3}{4}$ in.; lifting-shaft arm, $18\frac{1}{2}$ in.; from center of main shaft to center of lifting-shaft, $32\frac{1}{2}$ in.; to center of rocker box, $50\frac{1}{4}$ in.; the lifting-shaft centers vertically, is even with the top of frame; the rocker arm is $6\frac{1}{2}$ in. below top of frame.

Trucks.—Are Jewell's patent truck with two fluted taper rollers, with cast-iron spoke wheels, 30 in. in diameter. Journal-bearings 10 in. long, 5 in. in diameter.

Pilot.—Is made of diagonal or sloping bars resting their lower ends upon the upper one of two horizontal bars which form the bottom of the pilot, all as shown in Fig. 1.

Running Boards.—Are of 3-16 in. wrought-iron plates, with a 2-in. angle-iron riveted on front edge, secured to the boiler shell by wrought-iron brackets.

Injectors.—On each side is one of Friedman's No. 7, non-lifting, old style injectors and no pumps.

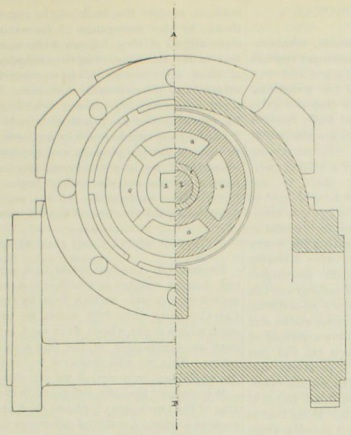


Fig. 6.—Throttle Valve.

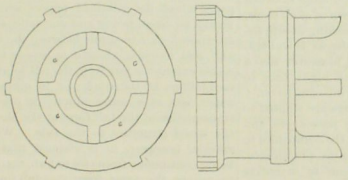


Fig. 7.—Throttle Valve.

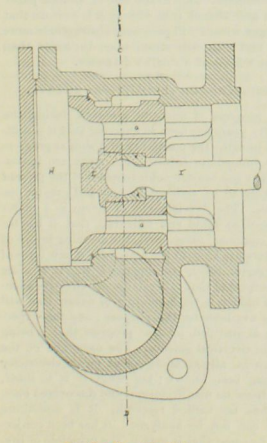


Fig. 8.—Throttle Valve.

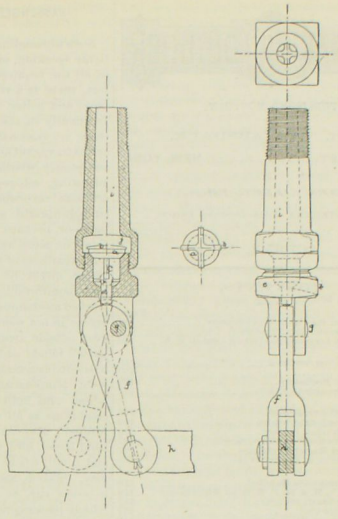


Fig. 10.—Cylinder Cock.

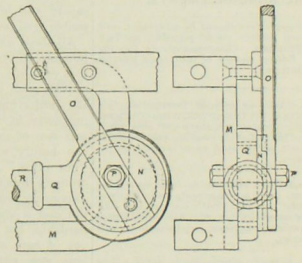


Fig. 9.—Eccentric Throttle Lever.

THE New York Central road receives coal for its own use and for shipment, from its Geneva branch. At the junction with the main line at Lyons, N. Y., is an extensive yard in which the coal on its arrival is assorted and transferred both for shipment and for use in engines. The chutes are reached by a track of easy grade over a long trestle, upon which the coal is carried high enough to be dumped three times, first from the cars which bring it from the mines into the sheds, then from the sheds to the dump cars which carry it to the engines, and then from these cars to the engine tenders. A "Z" switch from the top of the trestle takes the cars over the chutes and sheds through which the coal is transferred to flats or other cars for further shipment, and when unloaded runs them by gravity down into the yard. The dumping shed for supplying locomotives is built across six tracks, and the water-pipes are so arranged in relation to the chutes that four engines headed either way on the main tracks take coal, water and sand at the same time, and in 2½ minutes, without disconnecting them from the trains. The sand is dried by steam from the same boiler that furnishes steam for pumping the water, and is elevated into the coaling sheds and supplied to the locomotives through chutes. There is a very convenient arrangement of tracks for running the dump cars between the sheds and the chutes where the engines are supplied, the tracks crossing the scales upon which the weighing is done. They are so placed about the dump-holes that several cars loaded with different qualities of coal can be kept ready, and when an engineer calls for either one, two, three or four tons of coal, a car loaded with requisite quantity can be run over the dump hole at once and emptied into the tender. Mr. Jas. Tillinghast, Assistant to the President of the company, and Mr. Charles J. Fisher, Chief Engineer, visited all the principal coal chutes of other roads, and then planned this one, which is the only one of the kind in the country.

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CONTENTS.

	PAGE.
ILLUSTRATIONS:	
Improved Girder for Car Journal Brasses	118
Patching of Locomotive Cylinders	121
Standard Mogul Locomotive—Illinois Central R. R.	123
COMMUNICATIONS:	
Friction of Bearing Surfaces	130
Car Inspection	130
Railway Master Mechanics	130
Patching Locomotive Cylinders	121
EDITORIALS:	
Passenger Car Conveniences	126
Paper Wheels and Axle Service	126
Progress of Electrical Science	126
Novelties in Locomotive Construction	127
Qualifications of Master Mechanics	127
Weight of Material in Freight Cars	127
MISCELLANEOUS:	
How Freight Trains are Handled	116
New Shops of C., M. & St. P. R. R. at Milwaukee	116
Some New Combination Cars	117
A Notable Private Car	117
A Surface Filler for Wood-work	118
Forcing Wheels on Shafts	118
English Railway Carriages	119
The Dirty Locomotive	119
The Rigby Car Wheel	121

EDITORIAL ANNOUNCEMENTS.

Addresses.—*Business letters should be addressed, and drafts and money orders made payable, to* THE NATIONAL CAR-BUILDER. *Communications for the attention of the Editor should be addressed* EDITOR NATIONAL CAR-BUILDER.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notice of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR-BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of the month.*

SUBSCRIPTIONS *to the* CAR-BUILDER *will be received, and copies kept for sale, at the following places:*

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L. SCHAFFNER, *Cigar and News Dealer, Grand Pacific Hotel, Chicago, Ill.*

WILLIE H. GRAY, 306 *Olive Street, St. Louis, Mo.*

ROBERT CLARKE & CO., 65 *West Fourth Street, Cincinnati, Ohio.*

SINCE the last number of our paper was issued, the land has been shrouded with the emblems of mourning expressive of the universal sorrow for the loss of the nation's chief magistrate, and abhorrence of a crime that will ever remain an ineffaceable blot on the page of history. It is not the province of a technical journal to note current political events, however startling and momentous, but the diabolical act perpetrated on the 2d of July, with its shocking sequel, may well form an exception. We need not say more; it would be a culpable omission to say less.

PASSENGER CAR CONVENIENCES.

Notwithstanding the completeness, comparatively speaking, of our railway passenger coaches in all the requirements of convenience and comfort, there is a constant demand for something more and better. These demands crop out quite frequently in the newspapers, and while some of them are reasonable enough, there are others that are extravagant and even absurd. The ease-loving voluptuary would doubtless prefer a velvety, self-adjusting, self-rocking reclining chair to the ordinary reversible seat, in which he is obliged to sit bolt-upright when the other half of it is occupied—or, perhaps a swinging hammock would at times be more agreeable in mitigating the worry and weariness of traveling. Many other desirable things might be suggested to make passengers more comfortable. Some kind of railway car-fan worked mechanically, so as to produce an artificial breeze in hot weather, would not come amiss, and even outside awnings to the windows, instead of slatted blinds and curtains, to keep out the sun without obstructing the view. A perfectly uniform temperature combined with ample ventilation, and both graduated to suit all physical conditions at all seasons, is another thing that is wanted; also convenient places for stowing away band-boxes, bird cages, valises and bundles large and small, where they would not be in any body's way. Station and speed indicators are wanted in every car, as well as some feasible method by which passengers may know with the least possible delay the reasons for irregular stops between stations, and the probable duration of such stops, without the trouble of guessing or asking questions. A head-rest attachment to seat-backs is wanted, that can be raised or lowered at pleasure; also a steady and brilliant light in the night time to enable aged people to read fine print—and so on.

All these and many more things are wanted to promote the comfort of railway passengers, and it is certainly for the interest of the companies to provide such conveniences as far as practicable. But unfortunately there is a limit to inventive ingenuity in this direction, imposed by the nature and uses of the vehicle itself. Reasonable people can hardly expect to traverse the continent at "cut rates," and at express speed, in a car of ordinary dimensions seating fifty persons, without dispensing with some of the luxuries of home life and a stationary abode. This may seem a hardship, but it can only be avoided by keeping out of cars altogether. Time was, and not very long ago either, when princes and potentates would have been more than content with the most ordinary facilities of railway travel as now existing, even leaving speed out of the account.

While we would not underrate the unavoidable discomforts incident to railway traveling, nor exonerate car-builders from blame for any remissness on their part in relieving these miseries, we would suggest, what the great majority of people know already, that much of the infelicity of this kind of traveling is due to a lack of courtesy and mutual respect among passengers themselves, many of whom are apt to forget that one occupant of a car is for the time being as good as another, provided he has paid his fare and does not make himself personally offensive. Locking the seat-backs so they can not be reversed at will, is an excellent thing, and prevents many a well-dressed hog from reposing his hoofs on the cushion of the next seat, which has just been occupied, and perhaps soon will be again, by ladies in elegant apparel. But while locking the seats prevents this particular abuse, it favors the practice of another incivility equally reprehensible. We refer to the habit which has become very common with young men, and even with men that are not young, of bracing their knees, in order to get into a reclining position, against the back of the seat in front of them, to the annoyance of its occupants, and especially so if they happen to be ladies. Each seat is for the time being the exclusive property of those who occupy it, and any interference by others is an unpardonable rudeness. These will serve as specimens, without referring to other improprieties that are practiced in railway cars.

Car-builders can do much by mechanical devices to make a journey pleasant and enjoyable to passengers, but no inventive ingenuity or code of regulations can enforce civility beyond a certain limit. The rest depends on the patience, self-denial and good breeding of the individual.

PAPER WHEELS AND AXLE SERVICE.

Engineering (London) refers to a paragraph in our August number in which it is stated that the record of car axle service kept by the Pullman Car Company since 1874 shows no broken axles upon which paper wheels were used, and suggests that an explanation of the fact would be interesting. This we will endeavor to furnish according to the best information we can obtain.

It is claimed that the difference in the construction of the two kinds of wheels (iron and paper) is such as to cause a material difference in the strain upon the axles, the strain being comparatively less in the case of paper wheels. It is admitted that in both cases the wheels are pressed on with the same average pressure, so that in this respect there is nothing to favor the axle in the one class of wheels more than the other. But with the paper wheel, the solidified paper—which is apparently as hard, heavy and unelastic as metal—is interposed as a medium between the tire and the hub, and as such, absorbs or lessens to an appreciable extent the jars from the rail joints and other inequalities of the track; or, in other words, the paper acts as a non-conductor in preventing the transmission of the full force of the blows through the wheel structure to the axle. With the iron wheels, however, it is claimed that the metal being continuous from tire to hub, there is nothing to relieve the axles from the full impact of the blow of the wheel upon the rail, and the result is to produce crystallization at an earlier stage of service and consequent liability to break. This is the theory, and it seems to be a plausible one, supposing the wheels in both cases to be of the same diameter. But in the case of 42-inch paper wheels and 33-inch iron wheels, it is obvious that the larger wheels will pass over obstructions more easily and with less strain upon the axles than will the wheels of a smaller diameter.

PROGRESS OF ELECTRICAL SCIENCE.

The progress of scientific research during the last fifty years has been so amazing that it is difficult to imagine the possibility of a similar progress in the immediate future. Yet there are indications that the boasted achievements of the present are likely to be eclipsed by new and greater discoveries. The development of steam as a motor has been so rapid and universal, that it has become common place, and the teeming brains of inventors are busy in the search for a new force of still greater utility to supersede it. It is more than suspected that other and more effective agencies lie hidden in the laboratory of nature that will yet be available for this purpose; and this expectation is justified by the progress that is being made in electrical science. The existence of the mysterious, all-pervading agent called electricity has long been known; but what it is in itself, aside from its manifestations and discovered uses, has thus far baffled research. It is something which can not be analyzed. It has been conjectured by some that it may be the principle of life, or something akin to it of which the finite intel-

lect can attain no positive knowledge. Its manifestations, however, are constantly bringing to light new and startling facts. With respect to its utility in supplying the wants of human existence, a vast and unexplored field of discovery is beginning to be opened up. We already know something of its capabilities as a means of transmitting intelligence independently of time and space. Its service in this respect has become a prosaic fact of daily experience, so much so, that to dispense with the telegraph would be like going back to original chaos. In a kind of feeble, experimental way, it already plays an important part in mechanics, in the treatment of diseases, and in the generation of heat and light. Its illuminating power is being rapidly developed in the face of obstacles that at first seemed quiet discouraging. It is a thing of use, and not a curious toy to be played with.

This is essentially a reasoning age. Superstition is nowhere; eloquence has lost its charm; sound logic overrides every thing because it leads to practical results. In every branch of research where the ends to be attained are such as promote the enjoyments and comforts of existence, we reason very sharply from what we know to what we don't know, advancing by successive parallels as in siege operations. The citadel is bound to be taken, especially if the spoil is tempting and valuable. Electrical science is just now carrying on a siege. It is in a state of transition from crude experiment and imperfect knowledge to results that would be astounding could they be clearly foreseen. The days are almost forgotten when land and ocean telegraphy was a novelty. The lighting of streets and buildings with the brilliant carbons is already making inroads on the sickly mal-odorous gas, the heating problem is being grappled with, and experiment is constantly developing new facts and principles in respect to the numberless uses to which electricity may be applied. It may be hazardous to predict that as a motor it will ever take the place of steam, but it would be no less hazardous to set bounds to the possibilities of what may yet be realized in this field of discovery.

NOVELTIES IN LOCOMOTIVE CONSTRUCTION.

If a revolution is not impending in the construction and capacity of passenger locomotives, it is not owing to any lack of ambitious and persevering effort in that direction. The Fontaine experiment does not so far seem to be either a success or a failure. Although it is not just now attracting any special attention, it may yet have a future far more brilliant than the Keeley abortion or the Prosser cylinder car. In the meantime, another experiment is in progress — the so-called hydrocarbon locomotive — the merits of which are set forth in somewhat florid style by a correspondent of the Chicago *Tribune*. The machine is in process of construction at the Grant Locomotive Works, Paterson, N. J., and if it turns out to be as big a thing on the track as it is on paper, the importance of the revolution that is likely to be effected by it can scarcely be exaggerated. Its peculiar feature is the generating and burning of hydrogen gas, producing an intense heat, which is distributed over a largely increased surface by means of small copper flues, the water being everywhere around and between them. The flame produced by the combustion is devoid of color and brightness, the great heat and the enormous evaporation are attended with a minimum cost of fuel, there is no forced draft, no noise from the exhaust, no smoke nor cinders, and the percentage of fuel economy as compared with coal-burning engines almost surpasses belief. The dead weight of fuel will be merely nominal, and no replenishment necessary during the longest runs. A number of minor advantages are also claimed, which it is not worth while to enumerate at this preliminary stage. The weight of the locomotive will be 48 tons, cylinders 17 × 24 inches, driving wheels 61 inches. Its construction being already well advanced, the public will not have to wait long for the performance, the results of which will, it is confidently predicted, abolish coal-burning engines and all canal and sailing-vessel competition in transportation business.

QUALIFICATIONS OF MASTER MECHANICS.

We print the communication of a correspondent setting forth the importance of a preparatory course of elementary and technical instruction as a necessary qualification for railway master mechanics. Such a course of study would certainly be very desirable as a basis for the practical knowledge to be subsequently acquired, and were it made a prerequisite in every case, the results would no doubt be manifest in better and more satisfactory work. This, however, is not a new idea. The subject has often been discussed in mechanical journals. If master mechanics and master car-builders are, as a class, deficient in the science of engineering and a knowledge of technical formulas and methods of demonstration, it is not so much their fault as it is a fault of the system of which they form a part. The rapid extension of railroads and the enormous growth of traffic, together with the constant improvement in tools, machinery and appliances of every sort, have made the shops themselves the only practical seminaries for instruction, not in the higher elements of mathematics and knowledge of abstract principles, but in devising ways and means for meeting mechanical emergencies in the quickest and most practical way. Meanwhile, there has been a steady advance from the rude, primitive and unscientific, towards the present accepted standards of perfection. This inevitable progress must necessarily raise the standard of qualification. It cannot remain stationary, much less can it be lowered. Higher standards imply better pay. We are impressed with the notion that the road companies get value received for every dollar of salary now paid to their master mechanics and car-builders. But we are, nevertheless, in favor of the suggestion of our correspondent in regard to technical schools of instruction as a good thing in itself. Such schools would doubtless be largely instrumental in making the positions referred to more important and remunerative, and less subordinate than they now are.

WEIGHT OF MATERIAL IN FREIGHT CARS.

We copy the following from an article in the *Railway Review* on "The Utility of Weight in Cars":

"It is sometimes considered in construction that the quantity of material used increases the strength of the structure. In some instances it does; ordinarily it does not. Oftentimes an excess of material is a cause of weakness, as it would be in roof and bridge trusses, etc. Perhaps a greater latitude in this direction is permissible in car construction than in other classes of work. While the exercise of sound judgment in the use of material will insure strength and economy of construction in all kinds of work, yet many builders err on the heavy side because of their responsibility. Weakness in construction is always an evidence of ignorance. If an excess of heaviness or weight in the building of cars is allowable, it is because the car has a heavy load to carry, and the framework must be extra heavy and strong to overcome the strain caused by the inertia of the load. Admitting that there is an excess of material used in the construction of cars, is it not necessary? The car-builder has to insure longitudinal stiffness, lateral strength; the load is to be supported with as little vibration as possible; and a combination of these conditions is requisite to save the loaded car from going to pieces when it suffers a derailment."

The economical adjustment of weight, strength and carrying capacity in the construction of freight cars, is not an easy matter. The writer of the above extract, in what he says about excess of material, evidently refers to the floor-framing of cars, which consists of end and longitudinal sills, tie-timbers and bolsters, with the usual iron-rod trussing. So far as the weight of load and the draft and buffing strains are concerned, the floor-frame embodies the essential strength of the car, the other parts being relatively subordinate. For carrying the maximum load for which a car is rated, there need be no excess of material or weight in any part of the structure, if by excess is meant what is superfluous. The floor timbers must be stiff enough to carry the load without sagging, but any additional material increases the non-paying weight and taxes the motive power—very slightly it may be in the case of a single car, but in the economy of train expenses it is the aggregate of little things which tells. There is enough of dead weight to haul in the transportation of empty or partly loaded cars, without adding thereto a surplus of material beyond what the load requires. It is much easier to adapt the load to the car than the car to the load; and if this principle is not adhered to, car-builders can never know when a car of a given length has sufficient strength of material to carry the quantity of pig iron, or tin plate, or other heavy freight that may be put into it in a pressure of business. As regards collisions and derailments, a builder would hardly be warranted in constructing cars with an extra margin of strength sufficient to preserve them intact in such contingencies. Such accidents are exceptional, and the damage caused thereby by the wrecking of cars is doubtless less in the long run than the extra cost of building and hauling cars strong and heavy enough to stand the ordeal of accidents of this class. A few years ago, an extra heavy freight or passenger car was not considered creditable to the builder in an economical point of view. From present indications, there seems to be some danger of a reaction in the opposite direction.

THE twelfth annual convention of the Master Car-Painters' Association was held at the Metropolitan Hotel, in New York, beginning on the 21st ult., and continuing three days. There was a good attendance, about 40 members being present and representing the prominent railroads of the country. A number of interesting papers were read, some of which we shall try to make room for in our future issues. The old officers of the Association were re-elected, as follows: President, D. D. Robertson, Michigan Central; Vice-President, J. H. Will, New York Central & Hudson River; Secretary and Treasurer, R. McKeon, New York, Pennsylvania & Ohio.

THE present activity in every branch of railway supply manufacture is really wonderful. There is an immense and constantly-increasing demand for machinery and tools for the equipment of new car shops in various parts of the country, and also to replace second-rate or worn-out appliances in old shops. So great is the accumulation of orders, and the reduction of certain kinds of machinery usually kept in stock, that contracts for early delivery are not easily made. Every day confirms this state of things as respects rolling-stock construction, repair and maintenance, and is a pretty sure indication that the roads have something to do, and that they are not incurring unnecessary outlays for business yet to be developed.

THE inventor of a watch that winds itself up and gives a pint of milk a day has arrived in Washington to secure a patent.

"Do you go to Sabbath-school, my lad," kindly asked a city missionary of a depraved little Dubuque urchin. "Nary," answered the innocent child, "but I've got a fightin' cock that can walk over any bird in this town that wears gaffs."

Cast-Iron Lathe Tools.

A correspondent of *The Leffel Mechanical News* says he has received from Mr. G. W. Strattan, Master Mechanic of the Pennsylvania Railroad shops, at Altoona, two cast-iron lathe tools used at those shops, and made of the usual mixture put in the chilled tread of car wheels. The tools of this description are of the various forms used for planing and turning, and are chilled about half an inch at the point, and ground to an edge on an emery wheel. They give three times the service of cutters made of the best tool steel, under the same conditions, without grinding, and are found to be very useful upon cast iron, brass work, and even upon stell that is very hard. They are also used in the planing of locomotive cylinders, slide-valves and eccentrics, the planers being run at the usual speed.

This is not a new discovery, but none the less valuable on that account. Mr. W. H. Paige, the former superintendent of the Wason Car Co., at Springfield, Mass., used chilled cast-iron cutters for turning axles two years ago, and found them to be far more serviceable than those made of steel, and a great deal cheaper. That they are not more generally used is due in part to ignorance of their merits, and in part to prejudice, and not to any inherent defect in the tools themselves on account of the material of which they are made.

The Coach Painter for Sept. 15, in addition to its usual attractive variety of matter, is accompanied with a 2-page supplement of rare artistic merit—a side elevation of a Pennsylvania R. R. locomotive and passenger car, colored, tinted, bronzed, varnished and lettered with a beauty and delicacy that fairly counterfeits the best work of the shops. It is a superb piece of color printing, and worthy of a glass and frame.

The Industrial News, an illustrated monthly journal published by the Inventors' Institute, Cooper Union, New York, contains a variety of well selected matter of special interest to readers who desire to keep pace with the progress of invention and the mechanic arts. It is well printed, and contains a monthly digest of patent decisions.

The Painters' Magazine contains a mass of well selected and digested information in reference to the technicalities of house, car and locomotive painting, with illustrations of decorative designs, lettering, etc., and prices current of paints and varnishes. It should be in the hands of every car painter. Published monthly, 72 William street, New York. N. C. White, Editor. Price, $1.50 per year.

Fifteenth Annual Report of the Master Car-Builders' Association.—The regular report of the proceedings of the convention held in New York in June last has just been published in the usual form, but containing about 100 pages more than last year's report. The discussions are very fully reported, and, so far as appears from a brief examination, are a faithful record of the views of members upon the subjects presented for consideration. The reports of committees and the substance of the discussions have already been published in the CAR-BUILDER and other railway journals, but the full report is none the less worthy of careful examination by railway men and others who would form an intelligent judgment of the usefulness of the Association in the matter of improved construction and management of the various classes of railway cars.

Traveler—How do you brokers manage to undersell the railroad companies?

Scalper—Vell, you see, ve don't got so much expenses. Dose railroad fellers haf to keep up the rolling stock an' pay ze hands. We don't. It's all clear profit with us!—*Ex.*

SPEAR'S anti clinker coal-burning car stoves are already too well known to railway men and the traveling public to need special commendation. But as the winter is close at hand we take pleasure in calling attention to the Spear stove designated as pattern A, as combining in a most effective way the essentials of heating and ventilation. The cold air from the outside is introduced at the bottom, and is heated by passing up on one side and down on the other to an opening in the base, where it is discharged into the car and distributed so as to produce a uniformity of temperature, while the vitiated air is forced out at the top. The heated surface of the stove is at the same time protected by a sheet-iron drum casing, which prevents the air in the car from being cooked and rendered unfit for breathing, while at the same time those sitting near the stove are not incommoded by an excess of heat. The stoves are securely fastened in their places, and the doors prevented from flying open in case of accident, by wrought-iron latches held down by a cam.

PARKER'S CEMENT PAINT, manufactured by Cary, Ogden & Parker, Chicago, Ill., and adapted to railroad buildings, cars and car roofs, is one of the cheapest, most durable and effective preservatives for every kind of surface exposed to the weather. It is proof against moisture, is unaffected by heat or cold, covers better, works smoother, and is said to be equal to three coats of minerals mixed in the old way. It is composed of pure linseed oil, with no rosin or other injurious ingredients, is put up in eight different shades ready for the brush, and is guaranteed for five years. The firm is among the largest of the manufacturers of this class of goods at the West, and has unequalled facilities in its line, which includes coach colors, truck and roof shades, white lead, etc. It is supplying some of the leading railways and car manufacturers in the country, and its business is daily increasing. Specimens of cement paint attached to circulars, which will be sent on application.

THE EMPIRE PORTABLE FORGE CO., Cohoes, N. Y., manufacture forges for blacksmith work, with blowers that can be worked by hand or by power, producing a steady and uniform blast adjusted to suit any requirement. The "Western Hand-Blower, No. 1," with its adjustable tuyere, enables the operator to increase the quantity of blast for heavy work without increasing its strength, which can not be done with the bellows or other force blower. The frame is of angle-iron and is perfectly rigid; the fan does not slip or stretch, rot or burn; the wind blast is equal to that of Smith's large bellows, is worked by a swiveled handle; the bearings are Babbitted, and the gear wheels simple, accessible and easily replaced or repaired. It is, in fact, one of the most economical and indispensable appliances ever invented for blacksmith work.

THE EUREKA POST-HOLE DIGGER, manufactured by Campbell & Lill, 228 Lake street, Chicago, is claimed to be the most effective of this class of to ls. There is no clogging, knee-work or backache in its working, and it is equally adapted to stony, sandy or clay soils, doing the work much quicker than it can be done with plungers, augers or boring machines. It was awarded the grand medal and diploma at the Centennial Exposition, and has never failed to receive prizes at the State and county fairs. Some of the leading railroads in the country are using it, especially at the West.

AN unsophisticated person, with an inquiring habit of mind, was investigating the mysteries of a buzz-saw in a factory in Norwich, Conn., the other day, when he laid two of his fingers upon it to see if it was going. It *was*.

A SLEEPER is one who sleeps; a sleeper is also a place where a sleeper can sleep; and is, too, a thing over which runs the sleeper in which the sleeper sleeps. So that the sleeper in the sleeper sleeps while the sleeper runs over the sleeper as well as sometimes when it leaps off the track.

A COUNTRY paper says: "Lives there a man with soul so dead, who never to himself has said, I'll pay before I go to bed, the debt I owe the printer? Yes, there are some I know full well, who never such a tale could tell, but they I fear will go to—— well, the place where there's no winter."

AN Atlanta negro was very busy eating a watermelon at the Whitehall crossing as the State road train came in, when the locomotive with its glaring headlight struck him and landed him some rods out in the darkness. As he picked himself up he exclaimed, "Who swung dat lamp? Who frowed dat brick?" The locomotive was but slightly injured.

Our Directory.

We note the following changes since our last issue. Readers are requested to give us prompt notice of changes when they occur:

Ashtabula & Pittsburg.—Mr. J. M. Kimball has been appointed Superintendent, in place of D. B. McCoy, resigned.

Atchison, Topeka & Santa Fe.—Mr. P. Leeds has been appointed Superintendent of Southern Division.

Chicago & Alton.—Mr. Wm. McPhail has been appointed Master Mechanic of Kansas City Division, in place of Jas. T. Todd, resigned.

Cleveland, Columbus, Cincinnati & Indianapolis.—Mr. W. C. Quigley has been appointed Master Mechanic of Indianapolis Division, in place of A. R. McAlpine, resigned.

Columbus, Hocking Valley & Toledo.—This is the consolidated name for the Columbus & Hocking Valley and Columbus & Toledo roads.

Des Moines & Northwestern.—Mr. H. B. Skeel has been appointed General Superintendent.

Evansville & Terre Haute.—Mr. O. S. Lyford, General Superintendent of the Chicago & Eastern Illinois, has been appointed General Superintendent of this road also.

Kentucky Central.—Mr. J. H. Setchel, formerly of the Little Miami road, has been appointed Master Mechanic.

Louisville, New Albany & Chicago.—Mr. Josiah Bettis has been appointed Master Mechanic, vice Mr. Geo. H. Ruhlandt, resigned.

Louisville, New Albany & St. Louis.—Mr. J. Martin has been appointed Superintendent, in place of H. L. Shepherd, resigned.

Maine Central.—Mr. J. W. Philbrick has resigned his position as Master Mechanic. Ira K. Russell has been appointed Foreman of Machinery, and Charles H. Kenison Foreman of Car Repair Shops.

New York, Chicago & St. Louis.—Mr. Lewis Williams has been appointed General Manager, with office at Cleveland.

Philadelphia, Wilmington & Baltimore.—Mr. C. K. Lodge has been appointed Superintendent of the Central Division, which consists of the Westchester & Philadelphia and Philadelphia & Baltimore Central.

Pittsburg, Cincinnati & St. Louis.—Mr. E. B. Taylor is appointed Superintendent of P. C. & St. L. Division, in place of J. H. Barrett, resigned.

St. Paul & Duluth.—Mr. J. G. Callahan has been ap pointed Purchasing Agent.

Texas & Pacific.—Mr. Henry Bearup has been ap pointed Master Mechanic in charge of the shops at Marshall, Tex. He has been for 15 years on the Lake Shore & Michigan Southern.

Toledo, Delphos & Burlington.—Mr. F. A. Phillips, formerly of the Atlantic & Great Western, has been ap pointed General Manager.

Troy & Boston.—Mr. E. Crandell, late General Freight Agent, has been appointed Superintendent, in place of Eben E. Aldrich, deceased.

Union Pacific.—Mr. O. H. Dorrance, formerly of Texas & Pacific, is appointed Superintendent of the Western Division of the Kansas Division, in place of John T. Odell, who has gone to the Mexican Central.

CONTINUOUS DRAW-BAR PATENTS.

The following circular has been issued by the Secretary of the Western Railroad Association:

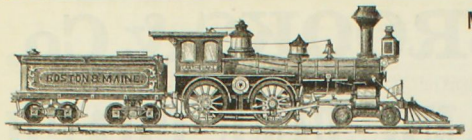
CHICAGO, Sept. 9, 1880.

To the Members of the Association:

GENTLEMEN: Claims have been pending for several years that the Continuous Draw-Bar sold by the Continuous Draw-Bar Company under the Middleton and the Griffith and Patterson patents is an infringement of patent 71,380, granted 3d December, 1867 (reissue No. 8,055, granted 19th February, 1878), to Edward L. Caum.

This Association has continuously advised against entertaining this claim, but to quiet all questions, and at our instigation, the Continuous Draw-Bar Company has recently purchased the Caum patent, its owners insert.ng in the assignment a full and absolute release to all the members of the Eastern and Western Railroad Associations from any and all liability for, or on account of, any infringement heretofore of said patent. Yours truly,

J. H. RAYMOND, Secretary, etc.



MANCHESTER LOCOMOTIVE WORKS,

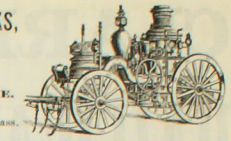
MANUFACTURERS OF

LOCOMOTIVES

AND THE

AMOSKEAG STEAM FIRE-ENGINE.

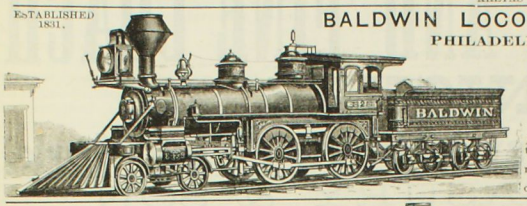
JOHN A. BURNHAM, President.
WM. G. MEANS, Treas., Boston, Mass.
ARETAS BLOOD, Agent, Manchester, N. H



ESTABLISHED 1831.

BALDWIN LOCOMOTIVE WORKS,

PHILADELPHIA, PA.



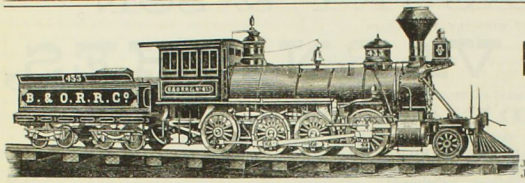
BURNHAM, PARRY, WILLIAMS & CO., PROPRIETORS,

GEO. BURNHAM,
CHAS. T. PARRY,
EDWARD H. WILLIAMS,
} MANUFACTURERS OF {
WM. P. HENSZEY,
EDW. LONGSTRETH,
JOHN H. CONVERSE.

LOCOMOTIVE ENGINES,

Adapted to every variety of service, and built accurately to standard gauges and templates. Like parts of different engines of same class perfectly interchangeable. Passenger and Freight Locomotives, Mine Locomotives, Narrow Gauge Locomotives, Steam Street Cars, etc.

Illustrated Catalogues furnished on application of customers. All work thoroughly guaranteed.



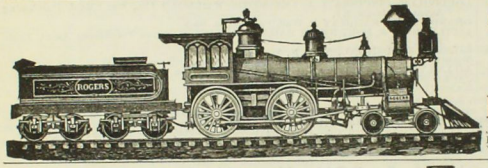
DANFORTH LOCOMOTIVE & MACHINE CO.

PATERSON, N. J.

NEW YORK OFFICE, 115 BROADWAY.

H. A. ALLEN, AGENT.

JOHN COOKE, President.
J. T. BLAUVELT, Vice-Pres.
} PATERSON, N. J. {
WM. BERDAN, Sec. & Treas.
JAMES COOKE, Supt.



ROGERS LOCOMOTIVE & MACHINE WORKS

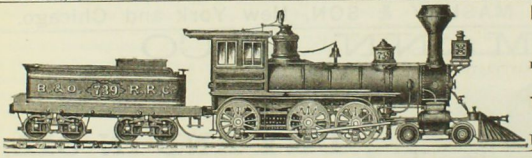
PATERSON, N. J.

New York Office, 44 Exchange Place.

MANUFACTURERS OF

Locomotive Engines and Tenders and other Railroad Machinery.

J. S. ROGERS, President.
R. S. HUGHES, Secretary.
WM. S. HUDSON, Sup't.
} PATERSON, N. J. {
R. S. HUGHES, Treas.,
44 Exchange Place, New York.



Pittsburgh Locomotive and Car Works,

PITTSBURGH, PA.,

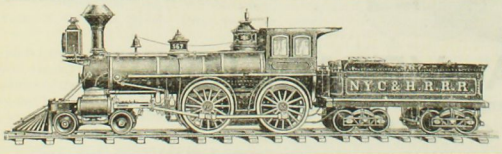
MANUFACTURERS OF

Locomotive Engines for Broad or Narrow Gauge Roads,

From standard designs, or according to specifications, to suit purchasers.

Tanks, Locomotive or Stationary Boilers Furnished at Short Notice.

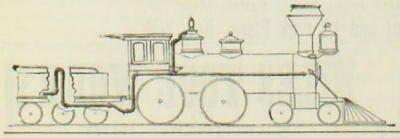
D. A. Stewart, Prest. D. A. Wightman, Supt. Wilson Miller, Sec. & Treas.



SCHENECTADY LOCOMOTIVE WORKS.

CHAS. G. ELLIS, President. EDWARD ELLIS, Treasurer.
WALTER McQUEEN, Vice-President.

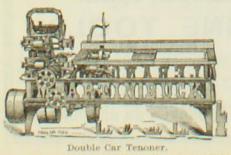
SCHENECTADY, N. Y.



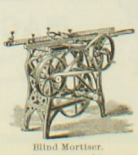
THE ASHTON VALVE CO.,

271 Franklin Street, Boston, Mass.

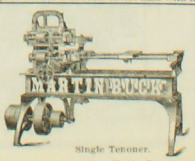
The Ashton Blow-back Safety-valve is constructed so as to conduct the escape steam which is blown off back to the tender, or to the smoke-box and up the chimney. By this arrangement the heat of the escape steam, instead of being wasted as it is when an ordinary safety-valve blows off, is communicated to the cold water in the tender. This not only results in an important economy, but it renders the escaping steam noiseless, and the increase of temperature of the water has a tendency to deposit some of its impurities before it is pumped into the boiler. It thus *stops the noise, saves fuel, and all engines steam better and faster, and do more effective work with these valves* than with those in ordinary use.



Double Car Tenoner.



Blind Mortiser.



Single Tenoner.

Single, Double and Triple Tenons and Gaining done on the same machine; especially adapted to car work. Single Tenoners, all Iron, with carriage mounted on trucks; Blind Mortiser and Borer combined for fixed and rolling slats; Adjustable Groover Heads, and a full line of Wood-working Machinery.

MARTIN BUCK, Lebanon, N. H.

PATENT PORTABLE VALVE SEAT ROTARY PLANING MACHINE

L. B. FLANDERS MACHINE WORKS
1025 HAMILTON ST. PHILA. PA.

NEW DESCRIPTIVE CIRCULAR ON APPLICATION.

Directory of Master-Mechanics and Master Car-Builders

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* Mechanical Engineer. † Mechanical Superintendent. ‡ General Master Mechanic. †† Gen. Master Car-Builder. § Master of Machinery. ‖ General Foreman. ** Supt. of Machinery. §§ Supt. of Motive Power and Machinery. ‡‡ Supt. Cars and Buildings. ¶ Supt. of Equipment.

A

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
Alabama Great Southern	M. J. Meehan	Geo. Hibbert	Chattanooga, Tenn.
Albany & Susquehanna	§§R. C. Blackall	R. C. Blackall	Albany, N. Y.
Albany & Susquehanna	C. A. Jones	J. R. Skinner	Oneonta, N. Y.
Arkansas Midland	J. B. Johnson	J. B. Johnson	Helena, Ark.
Asheville & Spartanburg	M. Fraser	W. B. Brown	Spartanburg, S. C.
Ashtabula & Pittsburg	Geo. J. Parkins	Wm. Marquis	Allegheny City, Pa.
Atchison, Topeka & Santa Fe	§§Geo. Hackney	‖Henry Hull	Topeka, Kan.
Atchison, Topeka & Santa Fe	A. C. Stiles		Pueblo, Col.
Atchison, Topeka & Santa Fe	C. Hackney		Topeka, Kan.
Atchison, Topeka & Santa Fe	John Fagan		Kansas City, Mo.
Atchison, Topeka & Santa Fe	J. M. Smith		Emporia, Kan.
Atchison, Topeka & Santa Fe	W. W. Wheeler		Nickerson, Kan.
Atchison, Topeka & Santa Fe	E. H. Esterbrook		Dodge, Kan.
Atchison, Topeka & Santa Fe	J. Q. Adams		Raton, N. M.
Atchison, Topeka & Santa Fe	H. W. Somers		Las Vegas, N. M.
Atchison, Topeka & Santa Fe	W. T. Allen		Pittsburg, Pa.
Allegheny Valley	G. W. Glass	R. Gunning	Atlanta, Ga.
Atlanta & Charlotte Air-Line	C. D. Wall	C. D. Wall	Atlanta, Ga.
Atlanta & West-Point	Wm. Rushton		Newnan, Ga.
Atlanta & West-Point		R. D. Cole	New Berne, N. C.
Atlantic & North Carolina	Basil Manly		Albuquerque, N. M.
Atlantic & Pacific	§§G. B. Simonds	G. B. Simonds	

B

Baltimore & Ohio	§John C. Davis	L. Packard	Baltimore, Md.
Baltimore & Ohio	A. J. Cromwell, *Asst'M. of M.*		Baltimore, Md.
Baltimore & Ohio	I. N. Kalbaugh		Baltimore, Mc.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	Sam. Houmon		Piedmont, Va.
Baltimore & Ohio	Robert Maxwell		Cumberland, Md.
Baltimore & Ohio	Chas. Hirsch		Wheeling, W. Va.
Baltimore & Ohio	S. B. Crawford		Grafton, W. Va.
Baltimore & Ohio	Alex. Laird		Parkersb'g, W. Va.
Central Ohio Division	O. B. Perkins		Zanesville, O.
Ohio & Chicago Division	§W. H. Hanson		Newark, O.
Central Ohio Division	E. L. Weisgerber		Newark, O.
Central Ohio Division	H. M. Ingler		Bellaire, O.
Lake Erie Division	And. Beckert		Sandusky, O.
Chicago Division	W. Y. Johnston		Garrett, Ind.
Chicago Division	F. J. Gunther		Chicago Junc., O.
Chicago Division	Geo. F. Wilson		Garrett, Ind.
Pittsburg Division	§John E. Sampsel		Connellsville, Pa.
Baltimore & Potomac	§§R. H. Soule		Baltimore, Md.
Bath & Hammondsport	Allen Wood		Ham'ondsp't, N. Y.
Bedford, Springville, O. & Bloom'd	Capt. Geo. Elliott		Bedford, Ind.
Bellefonte & Snow-Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Bennington & Rutland	G. W. Blanchard		Rutland, Vt.
Boston & Albany	§§A. B. Underhill	J. B. Weston	Springfield, Mass.
Boston & Albany		††F. D. Adams	Allston, Mass.
Boston & Albany	T. B. Purvis	J. E. Doran	Greenbush, N. Y.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Barre & Gardner	Chas. F. Brigham		Worcester, Mass.
Boston, Concord & Montreal	Ralph Adams	L. D. Pickering	Lake Village, N. H.
Boston & Maine	Wm. Smith		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston & Lowell	J. F. Crockett	J. F. Crockett	Boston, Mass.
Boston & New York Air-Line			New Haven, Conn.
Boston, Revere Beach & Lynn	J. L. Folsom	John Coghlan	Boston, Mass.
Brunswick & Albany			Brunswick, Ga.
Burlington & Missouri River in Neb.	D. Hawksworth	D. Hawksworth	Plattsmouth, Neb.
Burlington, Cedar Rapids & Nor.	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Ia.
Burlington & Southwestern		A. B. Allen	Farmington, Ia.
Buffalo & Southwestern	J. G. Hubbard		Buffalo, N. Y.
Buffalo, New York & Philadelphia	Allen Vail		Buffalo, N. Y.

C

Cairo & St. Louis	R. M. Pringle	R. M. Pringle	E. Carondelet, Ill.
Cairo & Vincennes	A. Van Tuyl	A. Van Tuyl	Carmi, Ill.
California, Pacific & Northern	D. Rutherford	D. Rutherford	So. Vallejo, Cal.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canadian Pacific	†T. Irwin		Brockville, Can.
Canada Southern and Braches	*John Ortton	††John Ortton	St. Thomas, Ont.
Canada Division	‡W. A. Short	Robert Potts	St. Thomas, Ont.
U. S. Division	O. P. Dunbar		Grosse Isle, Mich.
Carolina Central	§Jas. Maglenn	S. R. Ethridge	Laurinburg, N. C.
Catasaugua & Fogelsville	Tho. E. Evans	Chas. J. Holbach	Catasaugua, Pa.
Central of Georgia	D. D. Arden	R. M. Barthlemas	Savannah, Ga.
Atlanta Division	D. M. Gugel	Jas. A. Knight	Macon, Ga.
Central of New Jersey	Wm. Woodcock	George Hackett	Elizabeth, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central of Iowa	John Player	T. L. Seevers	Marshalltown, Ia.
Central Pacific	‡A. J. Stevens	††Benj. Welch	Sacramento, Cal.
Central Pacific		G. J. Turner	Sacramento, Cal.
Western Division	Geo. D. Welch	W. B. Ludlow	Oakland, Cal.
Visalia Division	S. Johnson		Tulare, Cal.
Sacramento & Oregon Div	M. W. Cooley	Phil. Douglas	Sacramento, Cal.
Truckee Division	Geo. Gregg	Wm. McPherson	Wadsworth, Nev.
Humboldt Division	W. F. Smith	J. C. Doughty	Carlin, Nev.
Salt Lake Division	Jas. Lamb		Ogden, Utah.
Salt Lake Division		A. Sherburne	Ogden, Utah.
Central Vermont	§§J. M. Foss		St. Albans, Vt.
New London & Northern Div.	I. W. Dow	S. O. Banks	New London, Conn.
Rutland Division	N. L. Davis	N. L. Davis	Rutland, Vt.
Chattaroi	W. C. Pendleton	Jos. Burley	Ashland, Ky.
Chesapeake & Ohio	§§John McFarland	J. N. King	Richmond, Va.
Chesapeake & Ohio	Tho. L. Chapman	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	John Bissett	W. H. Day	Florence, S. C.
Cherokee	C. E. Scruton		Cedartown, Ga.
Cheshire	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta		J. C. Troeger	Columbia, S. C.
Charleston & Savannah	H. A. Ulmo	J. D. Murphy	Charleston, S. C.
Chicago & Pacific	James Penny	C. N. Code	Chicago, Ill.
Chicago & Northwestern	** Geo. W. Tilton	††William Campbell	Chicago, Ill.
Iowa Division	J. O. Chapman	H. L. Preston	Clinton, Ia.
Peninsula Division	Geo. H. White		Escanaba, Mich.
Winona & St. Peters Div	W. A. Scott	W. A. Scott	Winona, Minn.
Chicago & Alton	§§Wm. Wilson		Bloomington, Ill.
Kansas City & St. Louis Div	Wm. McPhail		Mexico, Mo.
Chicago, Burlington & Quincy	§§H. B. Stone		Aurora, Ill.
Chicago Division	W. D. Rowley		Aurora, Ill.
Galesburg Division	Robert Colville		Galesburg, Ill.
Iowa Division	Joel West		Burlington, Ia.
Iowa Division	C. W. Eckerson		Creston, Ia.
St. Louis Division	L. E. Johnson		Beardstown, Ill.
Chicago & Springfield	W. B. McKenna		Clinton, Ill.
Chicago, Clinton, Dubuque & Minn.	E. Smedley	E. Smedley	Dubuque, Ia.

Chicago, Rock Island & Pacific	†T. B. Twombly	††B. K. Verbryck	Chicago, Ill.
Illinois Division	R. Biester	Samuel Pullman	Chicago, Ill.
Iowa Division	Jas. E. Morrill	Chas. M. Leonard	Davenport, Ia.
Keokuk & Des Moines Div.	S. W. Wakefield	Henry Kummer	Keokuk, Iowa.
Southwestern Division	R. O. Carscadin	Chas. R. Best	Trenton, Mo.
Iowa Division	J. G. Crockett		Stuart, Ia.
Chicago & West Michigan	Russell Booth		Muskegon, Mich.
Chicago & Eastern Illinois	Allen Cooke	Jas. T. Kerney	Danville, Ill.
Chicago & Iowa	H. S. Bryan		Aurora, Ill.
Chicago, Milwaukee & St. Paul	‡J. M. Lowry		Milwaukee, Wis.
La Crosse & P. Du Ch. Div		John Baillie	Milwaukee, Wis.
Northern Division		Wm. E. Kittredge	Milwaukee, Wis.
Iowa & Minn. Division	J. O. Pattie		Minneapolis, Minn.
Racine & S. West Div	John Taylor	E. A. Eddy	Racine, Wis.
Sioux City & Dak. Div	J. H. Moulton		Yankton, Dak.
Dubuque Division	E. Smedley		Dubuque, Ia.
Chicago, Pekin & Southwestern	A. R. Overton	F. Shields	Strator, Ill.
Chicago, Pekin & Southwestern			McComb C'y, Miss.
Chicago, St. Louis & New Orleans	**W. H. Purdy		McComb C'y, Miss
Chicago, St. Louis & New Orleans	E. D. Anderson		Jackson, Tenn.
Chicago, St. Louis & New Orleans	J. M. Keith		Water Valley, Miss.
Chicago, St. Louis & New Orleans	J. F. White		Shakopee, Minn.
Chicago, St. Paul, Minn. & Omaha	Matt. Ellis		Sioux City, Ia.
Chicago, St. Paul, Minn. & Omaha	F. W. Heinseiman	J. R. Reniff	Wabash, Ind.
Cincinnati, Wabash & Michigan	S. B. Tinker	S. B. Tinker	Cincinnati, O.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, O.
Cin., Ind., St. Louis & Chicago	§J. S. Patterson	J. S. Patterson	Richmond, Ind.
Cincinnati, Richmond & Chicago	Wesley S. Brewer		Ludlow, Ky.
Cincinnati Southern	J. Ivanson		Cleveland, O.
Cleve., Col., Cin. & Indianapolis	‡W. F. Turreff	W. F. Turreff	Brightwood, Ind
Indianapolis Division	W. C. Quigley		Cleveland, O.
Columbus & Cin. Division	W. L. Gilmore		Marietta, Ohio.
Cleveland & Marietta	Tho. Robertson	Tho. Robertson	Cleveland, O.
Cleveland & Pittsburg	§N. E. Chapman	N. E. Chapman	Akron, O.
Cleve., Mt. Vernon & Columbus	J. W. Holloway	J. W. Holloway	Loraln, O.
Cleve., Tusc. Valley & Wheeling	Tho. Ranson		Cobourg, Canada.
Cobourg, Peterboro & Marmora	Wm. Polson		Helena, S. C.
Columbia & Greenville	W. J. Parrish		Toledo, O.
Columbus, Hocking Valley & Tol.	I. G. Hutchins	J. M. Rockafield	Concord, N. H.
Concord	J. T. Gordon	J. T. Gordon	Concord, N. H.
Concord & Portsmouth	J. T. Gordon	J. T. Gordon	Concord, N. H.
Concord & Claremont	**J. N. Lauder		Springfield, Mass.
Connecticut River	§Wm. H. Stearns		Hartford, Conn.
Connecticut Western	John C. Barton		Lyndonville, Vt.
Conn. & Passumpsic Rivers	L. L. Brigham	L. F. Woodard	Corning, N. Y.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Cleveland, O.
Cumberland Valley	A. S. Hull	G. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	N. W. Howson	Nathan Binnix	Mt. Savage, Md.

D

Dak. So. & Sioux City & Pembina	J. H. Moulton	J. H. Moulton	Yankton, Dak.
Danbury & Norwalk	N. M. George	N. M. George	Danbury, Conn.
Danville & Southwestern	L. C. Hovey		Danville, Ill.
Danville, Olney & Ohio River	Louis Parisoe		Kansas, Ill.
Davenport & Northwestern	H. E. Woods		Davenport, Ia.
Dayton & Union	H. S. Gordon	H. S. Gordon	Dayton, O.
Dayton & Michigan	John Black		Lima, O.
Delaware, Lackawanna & West	Walter Dawson	Robert McKenna	Scranton, Pa.
Morris & Essex Division	W. H. Lewis		Kingsland, N. J
Morris & Essex Division		J. W. Baker	Dover, N. J.
Oswego & Syracuse Division	James Buchanan		Syracuse, N. Y.
Utica, Chenango & Susq. Div.	Tho. Thatcher		Utica, N. Y.
Bloomsburg Division	Charles Graham		Kingston, Pa.
Delaware & Chesapeake	Jos. A. Baynard		Easton, Md.
Delaware & Hudson Canal Co	**R. C. Blackall		Albany, N. Y.
Delaware & Hudson Canal Co		T. Orchard	Carbondale, Pa.
Rensselaer & Saratoga Div.	J. L. Corey	Chr. Körner	Green Island, N. Y.
Denver Pacific	§R. McDougall	John Clock	Denver, Col.
Denver & Rio Grande	N. W. Sample	N. W. Sample	Denver, Col.
Des Moines & Fort Dodge	John McGrayel	E. A. Avery	Grand Junction, Ia.
Detroit & Bay City	R. P. Baillie		Bay City, Mich.
Detroit, Grand Haven & Mil	Fred Parker		Detroit, Mich.
Detroit, Lansing & Northern	G. C. Watrous	G. C. Watrous	Ionia, Mich.
Dorchester & Delaware			Cambridge, Md.
Dunkirk, Allegheny Val. & Pitts	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.

E

East Broad Top	G. A. Haggerty		Orbisonia, Pa.
Eastern	§§Amos Pilsbury	J. D. Billings	Salem, Mass.
Eastern	D. S. Wallis		East Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
E. Tennessee, Virginia & Georgia	C. A. Hodge	Joseph Armbruster	Knoxville, Tenn.
Selma Division	B. J. Sitton	W. W. Pierce	Selma, Ala.
Alabama Cent. Division	Simon Gay	James Owens	Selma, Ala.
Ohio Division			Macon, Ga.
Macon & Brunswick Div	R. Wagnon		Norfolk, Va.
Elizabeth City & Norfolk	J. S. Whitworth		Erie, Pa.
Erie & Pittsburg	J. A. Wood	J. A. Wood	Eureka, Nev.
Eureka & Palisade	J. M. Alson		Mattawamkeag, Me.
European & North Am. (of Maine)	A. O. Bailey	A. O. Bailey	Evansville, Inc.
Evansville & Terre Haute	John L. White	John L. White	

F

Fitchburg	§§Geo. A. Cooledge	J. W. Marden	Charlestown, Mass.
Vermont & Mass. Div	W. A. Foster		Fitchburg, Mass.
Flint & Pere Marquette	T. J. Hatswell	R. McPherson	E. Saginaw, Mich.
Florida Central	James S. McElroy	James S. McElroy	Jacksonville, Fla.
Fort Wayne & Jackson	C. W. Hollister	C. W. Hollister	Jackson, Mich.
Fort Wayne, Muncie & Cincinnati	Wm. McPhail	Wm. McPhail	Fort Wayne, Ind.

G

Galv., Harrisburg & San Antonio	§§D. T. Davis	Jas. Alexander	Harrisburg, Tex.
Galveston, Houston & Henderson	J. G. Conlon		Galveston, Tex.
Geneva, Ithaca & Sayre	J. N. Weaver		Waverly, N. Y.
Georgia	John S. Cook	T. M. Preval	Augusta, Ga.
Grand Haven	R. Booth	R. Booth	Muskegon, Mich.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk	‖Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk	‖Warren Noyes		Gorham, N. H.
Grand Trunk		Duncan Meuish	Portland, Me.
Chicago Division	*K. Blackwell		Battle Creek, Mich.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Grand Rapids & Indiana	J. R. Fish	J. R. Fish	Grand Rapids, Mich.
Great Western, of Canada	†C. K. Donville		Hamilton, Can.
Great Western, of Canada	C. F. Hanson	Henry Childs	London, Ont.
Green Bay & Minnesota	‖Edw. Osborne		Green Bay, Wis
Gulf, Colorado & Santa Fe	Geo. R. Nicols	W. H. Martin	Galveston, Texas.
Gulf, Western Texas & Pacific	James Mooney		Cuero, Texas.

H

Hanover Junction & Gettysburg	John J. Bingley	John J. Bingley	Hanover, Pa.
Hannibal & St. Joseph	Jas Long	Jas. Long	Hannibal, Mo.
Housatonic	N. Slingland	J. J. Ferris	Falls Village, Conn.
Houston, East & West Texas			Houston, Tex.
Houston & Texas Central	L. C. Noble	James McGee	Houston, Tex.
Huntingdon & Broad Top	Wm. Barkla		Saxton, Pa.

I

Illinois Central	**Ss. J. Hayes	W. B. Snow	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edans		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Ia.
Springfield Division	W. B. McKenna		Clinton, Ill.
Illinois Midland	J. G. Clifford		Paris, Ill.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Illinois & St. Louis	J. H. Smith		Belleville, Ill.
Illinois & St. Louis		Charles Rothe	E. St. Louis, Ill.
Indianapolis, Decatur & Springfield	Pulaski Leeds	Pulaski Leeds	Indianapolis, Ind
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn	Geo. H. Pratt	Mattoon, Ill.
Indiana, Bloomington & Western	E. Hiserodt	E. Hiserodt	Urbana, Ill.
Ohio Division	Jos. S. Porter		Sandusky, Ohio.
International & Great Northern	R. H. Johnson	H. H. Sessions	Palestine, Tex.
Intercolonial	†H. A. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, O.

J

Jacksonville, Pensacola & Mobile	J. P. Laird		Tallahassee, Fla.
Jeffersonville, Mad. & Indianapolis	Wm. Swanston	Edw. Austin	Jeffersonville, Ind.
Jacksonville, N. West. & S. East.	B. J. Miller		Jacksonville, Ill.
Joplin	P. T. Butterly	P. T. Butterly	Girard, Kan.
Junction & Breakwater	J. A. Maguire		Lewes, Del.

K

Kansas City, Fort Scott & Gulf	J. S. McCrum	A. N. Montier	Kansas City, Mo.
Kansas City, Lawrence & South'n	J. S. McCrum		Kansas City, Mo.
Kan. City, St. Jo. & Coun. Bluff	F. A. Chase	Thos. Aylesbury	St. Joseph, Mo.
Kansas Central	Wm. McCall		Leavenworth, Kan.
Kaw Valley Division	James Long		Armstrong, Kan.
Smoky Hill Division	John B. Daily		Ellis, Kan.
Kentucky Central	J. H. Setchel	J. L. Hackathorn	Covington, Ky.
Knox & Lincoln	Wm. A. Field	C. L. Turner	Bath, Me.

L

Lake Erie & Western	¶H. L. Cooper		Lima, Ohio.
Lake Ontario Southern	Geo. Thompson	Wm. Currier	Sodus Point, N. Y.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" "		Frank O. Bray	Adrian, Mich.
Toledo Division	J. M. Sanborn	W. O. Smith	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withycombe	Cleveland, Ohio.
Buffalo Division	J. S. Graham	A. C. Robson	Buffalo, N. Y.
Lehigh Valley	John I. Kinsey		South Easton, Pa.
Lehigh Valley	H. Decker		Weatherly, Pa.
Lehigh Valley	John Campbell		Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Lehigh Valley	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	James Eblin	Jno. S. Lentz	Packerton, Pa.
Little Rock, Miss. River & Texas	Joseph Taylor	Joseph Taylor	Argenta, Ark.
Los Angeles & Independence	Jas. Velsir	J. S. Young	Arkans's City, Ark.
Louisville, New Albany & Chicago	Josiah Bettis		Los Angeles, Cal.
Long Island	Jas. Thompson	Jas. Thompson	New Albany, Ind.
Louisiana Western	B. B. Harrop		L. Isl'd City, N. Y.
Louisville, Cincinnati & Lexing'n	H. Middleton		Vermilionville, La.
Louisville & Nashville	**Reuben Wells	H. Middleton	Louisville, Ky.
Nashville & Decatur Div	W. H. Thomas	J. P. Furguson	Nashville, Tenn.
South & North Ala. Div	C. W. White		Birmingham, Ala
St. Louis Div	Thos. Walsh	W. H. H. Price	Mt. Vernon, Ill.
Clarksville Division			Bowling Green, Ky
Memphis & Ohio Div	Wm. Pike		Memphis, Tenn
Mobile & New Orleans Div	Wm. Adair		Mobile, Ala.

M

Maine Central	Ira K. Russell		Waterville, Me.
Maine Central		C. H. Kenison	Augusta, Me.
Manchester & Lawrence	J. T. Gordon	J. T. Gordon	Concord, N. H.
Manhattan Beach			Bay Ridge, L. I.
Manhattan Elevated	T. W. Peeples	H. A. Webster	New York, N. Y.
Marietta & Cincinnati	E. M. Bosley	E. M. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Onton'gn	W. H. Williams	H. D. Lyons	Marquette, Mich.
Memphis, Paducah & Northern	G. M. Taylor	G. M. Taylor	Paducah, Ky.
Memphis & Little Rock	Thos. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	H. N. Burford	J. J. Kasey	Memphis, Tenn.
Mexican National	J. C. Munro		City of Mexico.
Michigan Central	S. H. Edgerly		Jackson, Mich.
Midland of Canada		††Robert Miller	Detroit, Mich.
Milwaukee, Lake Shore & West'n	S. Charnley		Port Hope, Ont.
Minneapolis & St. Louis	Thos. Downing	Thos. Downing	Manitowoc, Wis.
Mineral Range	George T. Coon		Minneapolis, Minn.
Mississippi & Tennessee	J. C. Ramsey	S. J. Bolton	Hancock, Mich.
Missouri & Western	A. C. Persing		Memphis, Tenn.
Missouri Pacific	§§John Hewitt	John Hodge	Pierce City, Mo.
Missouri Pacific	R. D. Grant		St. Louis, Mo.
Missouri Pacific	Geo. W. Walshe		St. Louis, Mo.
Missouri Pacific	H. V. Faries		Sedalia, Mo.
Mobile & Montgomery	C. W. White	Lewis Barham	Atchison, Kan.
Mobile & Girard	J. C. Albrecht	A. J. Nix	Montgomery, Ala.
Mobile & Ohio	R. H. Briggs	J. T. Booth	Columbus, Ga.
Mobile & Ohio	John Fitzgerald		Whistler, Ala.
Mobile & Ohio	M. T. Carson		Macon, Miss.
Montgomery & Eufaula	D. M. Gugel	James A. Knight	Jackson, Tenn.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Macon, Ga.
			Algiers, La.

N

Nashua & Lowell	S. A. Davis	S. A. Davis	Nashua, N. H.
Nashville, Chattan'ga & St. Louis	James Cullen	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
Nebraska	D. Hawksworth		Plattsmouth, Neb.
Nevada Central	Z. T. Sprigg		Battle Mountain, Nev.
Newburg, Dutchess & Connecticut	W. G. Vanbuskirk		Dutchess J'n, N. Y.
New Brunswick	Jesse Mathews	T. N. Burpee	Gibson, N. B.
New Brunswick & Canada	Thos. Armstrong	G. Houlton	St. Andrew's, N. B.
New Haven & Northampton	Henry Fox	John Sweeny	New Haven, Ct.
New Jersey & New York	J. S. Drake		Jersey City, N. J.
New Jersey Southern	Rufus Blodgett		Manchester, N. J.
New York, Lake Erie & Western	§§F. M. Wilder		Susquehanna, Pa.
New York, Lake Erie & Western	J. H. Vreeland		Jersey City, N. J.
New York, Lake Erie & Western		J. N. Milebam	Jersey City, N. J.
New York, Lake Erie & Western	J. Van Vechten	J. Van Vechten	Port Jervis, N. Y.
New York, Lake Erie & Western	V. Blackburn		Susquehanna, Pa.
New York, Lake Erie & Western		D. B. Goodell	Elmira, N. Y.
New York, Lake Erie & Western	George H. Griggs		Hornellsville, N.Y.
New York, Lake Erie & Western	G. B. Ross	M. Wilder	E. Buffalo, N. Y.
New York, Lake Erie & Western	Jos. Bradt		Rochester, N. Y.
New York & Harlem	Theo. Wheeler		New York, N. Y.
New York Central & Hud. River	§§Wm. Buchanan	††Leander Garey	Morrisania, N. Y.
New York Central Division	§§G. B. Van Vorst	D. Hoit	West Albany, N.Y.
New York Central Division	§§Henry Waggeys		Syracuse, N. Y.
New York Central Division	§§Amos Gould	E. A. Olmstead	E. Buffalo, N. Y.
New York Central Division	§§S. L. White	Richard Donaby	Niagara Falls, N.Y.
Hudson River Division	§§Wm. Buchanan	Peter Smith	New York, N. Y.
New York Central Division		C. H. Burchard	E. Rochester, N.Y.
New York, Ontario & Western	Edw. Minshull	Edw. Minshull	Middletown, N. Y.
New York & New England	§§Geo. E. Borden	Elias E. Pratt	Boston, Mass.
Norwich & Worcester Div	Richard Colburn		Norwich, Ct.
Hartford Division	E. M. Humiston	S. Howland	Hartford, Conn.
New York, N. Haven & Hartford			
New York & New Haven Div	§§H. Kettendorf	James Denver	New Haven, Conn.
Hartford Division	§§Jno. Henney, Jr.	John Henney, Jr	Hartford, Ct.
New York, Penn. & Ohio	‡William Fuller	††Wm. Fuller	Cleveland, O.
New York, Penn. & Ohio	J. A. Cooper	D. S. Dockstader	Meadville, Pa.
New York, Penn. & Ohio	N. Wright	W. G. Huggard	Cleveland, O.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence*
New York, Penn. & Ohio			
New York, Penn. & Ohio	William Hill	J. W. Holmes	Kent, O.
New York, Penn. & Ohio		J. T. Fosdick	Galion, O.
New York, Penn. & Ohio		Geo. Wilson	Salamanca, N. Y
N. York, Susquehanna & Western	W. C. Ennis		Dayton, O.
New York, Providence & Boston	J. H. Anderson	J. H. Anderson	Wortendyke, N. J.
Norfolk & Western			Providence, R. I.
Norfolk & Peter. Division	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tenn. Division	F. Sterk	W. A. Morgan	Lynchburg, Va.
Northern Central	§§Howard Fry	§G. W. Demarest	Baltimore, Md.
Northern Central	J. M. Coale		Baltimore, Md.
Northern Central	James Strode	J. C. Dyott	Elmira, N. Y.
Northern New Hampshire	**Jas. N. Lauder		Concord, N. H.
Northern Pacific	**A. P. Farrar	A. P. Farrar	Brainerd, Minn.
Dakota Division	A. Rupert		Fargo, Dak.
Pacific & P. Oreille Div	C. Z. Sanders	Tho. G. Davis	New Tacoma, W.T
Northeastern		W. H. Day	Florence, S. C.
North Pacific Coast	James Walch		Saucelito, Cal.
Northern & Northwestern	P. Clark		Toronto, Can.

O

Ogdensburg & Lake Champlain	Abraham Klohs	A. Klohs	Malone, N. Y.
Ohio Central	J. B. Morgan		Bucyrus, O.
Ohio & Mississippi	Arthur Donaldson		Vincennes, Ind.
Ohio & Mississippi		J. P. Coulter	Aurora, Ind.
Cincinnati Division	John Thumser		Seymour, Ind.
Springfield Division	J. W. Stokes		Pana, Ill.
Old Colony	J. K. Taylor	A. Gleason	Boston, Mass.
Northern Division	Geo. W. Reynolds	Sam. Stevens	Taunton, Mass.
Olean, Bradford & Warren	Chas. Turner	Chas. Turner	Olean, N. Y.
Oregon & California	§§J. Brandt		Portland, Oregon.
Oregonian	Jas. Walch		Portland, Oregon.
Oregon Railway & Navigation Co	J. F. Curtis	Chas. Phipps	The Dalles, Oregon

P

Paducah & Elizabethtown	W. D. Robb	W. D. Robb	Elizabethtown, Ky.
Painesville & Youngstown	J. H. Jones		Painesville, O.
Panama	Thos. S. O'Brien		Aspinwall, U. S. C
Parker & Karns City	Philip Davies	Wm. Wolford	Parker City, Pa.
Pensacola & Selma	R. H. Kelly		Selma, Ala.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John F. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	J. G. Stewart	Pittsburg, Pa.
New Jersey Division	L. A. Bosdevex	E. F. Bosdevex	Meadowshops, N.J
New Jersey Division		David H. Baker	Jersey City, N. J.
New Jersey Division	§§H. S. Hayward		Jersey City, N. J.
New Jersey Division	Tho. Kerr	P. S. Bogart	So. Amboy, N. J.
New Jersey Division	R. McDowell		Lambertville, N. J.
New Jersey Division	W. McAllister		Camden, N. J.
West Penn. Division	C. B. Street	M. H. Fails	Blairsville, Pa.
Peoria, Decatur & Evansville	P. Reilly	J. S. Tufts	Mattoon, Ill.
Petersburg	R. B. Andrew	J. W. Fleming	Petersburg, Va.
Philadelphia, Wilmington & Balt	S. A. Hodgman	Wm. Lundgren	Wilmington, Del.
Central Division	S. D. Danfield	S. D. Danfield	Chester, Pa.
Philadelphia & Atlantic City	J. W. Wright	E. Lippincott	Camden, N. J.
	§§Howard Fry		Williamsport, Pa.
Philadelphia & Erie	W. F. Beardsley		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. T. Smith		Erie, Pa.
Philadelphia & Reading	*L. B. Parson	John H. Rankin	Reading, Pa.
Philadelphia & Reading	Jackson Richards		Philadelphia, Pa.
Catawissa Branch	W. H. Ellis	C. D. Ellis	Catawissa, Pa.
Piedmont Air Line	‡R. D. Wade		Richmond, Va.
Rich. & Danville Div		J. B. Vaughan	Richmond, Va.
North Carolina Div		J. C. Holt	Comp. Shops, N. C.
Pittsburg, Cincinnati & St. Louis	§§G. W. Rhodes		Columbus, O.
Little Miami Division		M. P. Ford	Columbus, O.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, O
Col. Cin. & Ind. Div	Geo. H. Prescott	Chas. H. Starr	Logansport, Ind.
Col. Cin. & Ind. Division	C. M. St. Clair		Indianapolis, Ind.
Cin. & Miss. Val. Division	Leroy Kells	Daniel Jewell	Lancaster, O.
Pitts. Cin. & St. Louis Div'n	Ross Kells		Dennison, O.
Pitts. Cin. & St. Louis Div'n		A. K. Mansfield	Steubenville, O.
Pittsburg, Fort Wayne & Chicago	Geo. J. Parkin	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago	Geo. W. Lowe	J. J. Kirkland	Crestline, O.
Pittsburg, Titusville & Buffalo	H. J. Bookhammer	John Monks	Oil City, Pa.
Pittsburg, Virginia & Charleston	Wm. Linziger		Pittsburg, Pa.
Pittsburg & Western	D. C. Courtney		Zelienople, Pa.
Pittsburg & Lake Erie	S. W. Haines		Pittsburg, Pa.
Portland & Ogdensburg	Geo. H. Poor	W. G. Brewer	Portland, Me.
Portland & Rochester	E. H. C. Tompson	David Dow	Portland, Me.
Port Dover & Lake Huron	H. M. Aldrich		Woodstock, Ont.
Port Royal & Augusta	Geo. Riley	J. H. Milton	Port Royal, S. C.
Poughkeepsie, Hartford & Boston	John L. Driscoll		Poughkeepsie, N.Y.
Prince Edward Island	A. Stronach	ID. M. Fraser	Charlottet'n, P. E. I
Providence & Springfield	G. T. Richardson		Pascoag, R. I.
Providence & Worcester	A. Griggs	A. Griggs	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	Rufus Smith	Bristol, R. I.

Q

Quebec, Mont., Ottawa & Occidental	†A. Davis		Montreal, Can
Quincy, Missouri & Pacific			Kirksville, Mo.

R

Raleigh & Augusta Air-Line	**B. R. Harding		Raleigh, N. C.
Raleigh & Gaston	**B. R. Harding		Raleigh, N. C.
Rhinebeck & Connecticut	John Dykeman	John H. Decker	Rondout, N. Y.
Rich., Fredericksburg & Potomac	H. Khun	W. H. Trainham	Richmond, Va.
Richmond & Allegheny	Geo. D. Harris		Richmond, Va.
Richmond & Danville	See Piedmont Air-Line.		
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Rich., York River & Chesapeake	A. R. Armstrong	A. B. Armstrong	Richmond, Va.
Rio Grande	G. W. Rendall	M. Markwood	Brownsville, Tex.
Rochester & Pittsburg	J. P. Hovey		Rochester, N. Y.
Rock Island & Peoria	Joseph Elder		Peoria, Ill.
Rome, Watertown & Ogdensburg	Geo. H. Haselton	Geo. H. Haselton	Oswego, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.

S

Saginaw Valley & St. Louis			St. Louis, Mich.
San Francisco & Northern Pacific	Ed. Reynolds	John Martin	Donahue, Cal.
Savannah, Florida & Western	§Jas. D. Hollister	‡P. N. Raynal	Savannah, Ga.
Savannah & Memphis	R. A. Bridges		Opelika, Ala.
Scioto Valley	C. H. Cory	C. H. Cory	Portsmouth, O.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma, Marion & Memphis	J. M. Levis		Marion, Ala.
Shenango & Allegheny	Edw. Richardson		Greenville, Pa.
Shepaug	C. M. Allen		Litchfield, Ct.
Sioux City & Pacific	C. H. Foster	C. H. Foster	Missouri Valley, I
Sioux City & St. Paul	F. C. Butterfield	F. C. Butterfield	Shakopee, Minn.
Southern Pacific			
Northern Division	J. T. Wilson	F. N. Bellisle	San Francisco, Ca
Los Angeles & Yuma Div	Jas. Velsir	J. S. Young	Los Angeles, Cal.
Tulare Division	S. Johnson		Tulare, Cal.
South Carolina	§P. J. Cochrane	Geo. H. Gramling	Charleston, S. C
Southern Central	Chas. G. Brown	H. Mooney,	Auburn, N. Y.
Southeastern (Canada)	A. G. Eastman		Richford, Vt.
Southwestern of Georgia	D. M. Gugel	James A. Knight	Macon, Ga.
South Pacific Coast	E. L. Reese	E. L. Reese	Newark, Ca

Railroad.	*Master Mechanic.*	*Master Car Builder.*	*Residence.*
Spartanburg, Union & Columbia	Wm. Platt	W. B. Brown	Spartanburg, S. C.
State Line & Sullivan	J. O. Blight		Towanda, Pa.
Stockton & Copperopolis	M. S. Webb	M. S. Webb	Stockton, Cal.
St. Croix & Penobscot	O. H. Cousen	H. C. Tincker	Milltown, Me.
St. Johns	Jas. M. Owens		St. Augustine, Fla.
St. Johnsbury & Lake Champlain	Geo. E. Howe		St. Johnsbury, Vt.
S. Joseph & Des Moines	F. A. Chase		St. Joseph, Mo.
St. Joseph & Western	E. Sleppy	E. Sleppy	So. St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mount. & So.	**O. A. Haynes	Oscar Doolittle	St. Louis, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
Missouri Division	W. H. Harris	H. M. Aldrich	De Soto, Mo.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis, Salem & Little Rock	Thomas Everson	A. W. Grosvernor	Steelville, Mo.
St. Louis & San Francisco	M. Kearney	M. Kearney	N. Springfield, Mo.
St. Louis, Keokuk & Northwest'n	Wm. Foley		Keokuk, Iowa.
St. Louis Bridge Co. & Tunnel R.R.	H. M. Smith		St. Louis, Mo.
St. Paul & Duluth	W. McFarland	John Hill	St. Paul, Minn.
St. Paul, Minneapolis & Manitoba	A. A. Ackerly		St. Paul, Minn.
St. Paul & Sioux City	Matt Ellis		Shakopee, Minn.
Sussex & Blairstown	E. H. Osborn	R. L. Sutton	Newton, N. J.
Syracuse, Binghamton & N. Y.	James Buchanan	James Buchanan	Syracuse, N. Y.
Syracuse, Chenango & New York	Geo. W. West	Wm. J. McMichael	Syracuse, N. Y.

T

Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn.
T. H. & Indianapolis (Vandalia Line. Indianapolis Div.)	§§C. R. Peddle	E. D. Carter	Terre Haute, Ind.
	Clinton Idler		Indianapolis, Ind.
Vandalia Div.	Chas. Butler		Effingham, Ill.
Logansport Division	A. W. Quackenbush		Logansport, Ind.
Texas & New Orleans	D. C. Smith	J. M. Mather	Houston, Texas.
Texas & Pacific	H. Bearup	H. H. Sessions	Marshall, Texas.
Brazos Division	J. F. Sechler		Dallas, Tex.
Tioga	Pere Bonny	D. H. Stratton	Blossburg, Pa.
Toledo, Delphos & Burlington	F. M. Mast		Delphos, O.
Toronto, Grey & Bruce	†David Preston		Toronto, Can.
Toronto & Nipissing	J. Haggas		Toronto, Can.
Troy & Boston	Z. B. Davis	R. V. Coon	Troy, N. Y.

U

Ulster & Delaware	J. B. Dykeman	Jno. H. Decker	Rondout, N. Y.
Union Pacific	‡‡L. H. Congdon	‡‡Geo. E. Stevens	Omaha, Neb.

Railroad.	*Master Mechanic.*	*Master Car Builder.*	*Residence.*
Eastern Division		A. M. Collett	Omaha, Neb.
Eastern Division		H. P. Makely	Grand Island, Neb.
Mountain & Laramie Div	T. A. Davis	John E. Davis	Cheyenne, Wy. T.
Western Division		R. V. Brinkley	Evanston, Wy. T.
Colorado Division	James S. Scott	E. G. Thomas	Golden, Col.
Denver, S. Park & Pacific Div	J. H. Kirk		Denver, Col.
Kansas Division	**John MacKenzie	J. B. Roberts	Kansas City, Mo.
Kansas Division	John B. Daily		Ellis, Kan.
Kaw Valley Division	Jas. McKenzie		Armstrong, Kan.
Utah Central	W. B. Armstrong	Sam. S. Tucker	Salt Lake City.
Utah Western	Robert Anderson		Salt Lake City, U.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Ithaca & Elmira	Geo. W. Cleveland	F. W. Magargil	Bressport, N. Y.

V

Valley	B. C. Bosworth	Chas. Blanchard	Cleveland, O.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vicksburg, Shreveport & Pacific	W. Bell Smith	W. Bell Smith	Monroe, La.
Virginia & Truckee	I. N. Fording		Carson, Nev.
Virginia Midland	J. E. Waddey	J. T. Nallo	Alexandria, Va.

W

Wabash, St. Louis & Pacific	Chauncy R. Morris		Fort Wayne, Ind.
Wabash, St. Louis & Pacific	Jacob Johann	B. B. Rose	Sprinzfield, Ill.
Wabash, St. Louis & Pacific	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Wabash, St. Louis & Pacific		C. H. Kohler	Toledo, Ohio.
Wabash, St. Louis & Pacific		J. S. Hazen	Stanbery, Mo.
Wabash, St. Louis & Pacific	W. H. Selby	C. S. Buck	Moberly, Mo.
Wallkill Valley	John Dykeman	Jno. H. Decker	Rondout, N. Y.
Washington & Ohio	Edward Dunn	John Harrison	Alexandria, Va.
Welland	James Taylor	Wm. H. Pay	St. Catharine, C.W.
Western & Atlantic	John H. Flynn	W. G. Grambling	Atlanta, Ga.
Western Maryland	§David Holtz	J. H. Nussear	Union Bridge, Md.
Western North Carolina	Geo. W. Gates		Salisbury, N. C.
Western, of Alabama	Robert King	F. M. Wade	Montgomery, Ala.
Western R. R. N. C.	Isaac W. Clark	Isaac W. Clark	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West Feliciana	J. A. Tilton	J. A. Tilton	Bayou Sara, La.
West Jersey	W. McAllister	C. C. Williams	Camden, N. J.
White Water	§L. W. Wingert		Harrison, O.
Wilmington, Columbia & Augusta	John Bisset	W. H. Day	Florence, S. C.
Wilmington & Welden	John Bisset	C. R. Clowe	Wilmington, N. C.
Wisconsin Central	§§J. B. Henney	J. B. Henney	Stevens' P't, Wis.
Wisconsin Valley	M. B. Snyder		Tomah, Wis.
Worcester & Nashua	John G. Brady	John G. Brady	Worcester, Mass.

Directory of Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † General Superintendent. ‡ Assistant General Superintendent. ‖ Assistant Superintendent. ** Superintendent of Transportation. §§ Assistant General Manager.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
A			
Adirondack	C. E. Durkee		Saratoga, N. Y.
Alabama Great Southern	*John Scott	R. W. Healey	Chattanooga, Tenn.
Alabama Great Southern	Chas. B. Wallace		Chattanooga, Tenn.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alleghany Valley	David McCargo	David McCargo	Pittsburg, Pa.
Anderson, Lebanon & St. Louis	Jas. A. Larnerd		Anderson, Ind.
Arkansas Midland	*A. H. Johnson		Helena, Ark.
Asheville & Spartanburg	James Anderson		Spartanburg, S. C.
Ashtabula & Pittsburg	J. M. Kimball		Ashtabula, O.
Atchison, Topeka & Santa Fe	*O. C. Wheeler	F. M. Smith	Topeka, Kan.
Atchison, Topeka & Santa Fe	D. J. Chase		Topeka, Kan.
Colorado Division	W. W. Borst		La Junta, Col.
Las Vegas Division	Thos. J. Seely		Las Vegas, N. M.
Rio Grande Division	Fred. Leach, Jr.		San Marcial, N. M.
Atlanta & Charlotte Air Line	*G. J. Foreacre	G. J. Foreacre	Atlanta, Ga.
Atlanta & West Point	*Cecil Gabbett		Atlanta, Ga.
Atlantic & North Carolina	A. B. Andrews		Newbern, N. C.
Atlantic & Pacific	F. W. Smith		Albuquerque, N.M.
Atlantic & Pacific		D. B. Sibley	Chicago, Ill.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
B			
Baltimore & Ohio	**W. M. Clements.	N. S. Hill.	Baltimore, Md.
Ohio & Chicago Division	*R. Dunham		Newark, O.
Ohio & Chicago Division	W. C. Quincy		Newark, O
Pittsburg Division	Thos. M. King		Pittsburg, O.
Bangor & Piscataquis	Arthur Brown		Bangor, Me.
Bath & Hammondsport	M. H. Hall		Hamm'dsp't, N. Y.
Bedford, Sp'gville, Owensb'g & Rd.	Jas. W. Kennedy	Jas. W. Kennedy	Bedford, Ind.
Bellefonte & Snow Shoe	Daniel Rhoads		Bellefonte, Pa.
Bell's Gap	Robert G. Ford		Bellwood, Pa.
Belt R. R. & Stock Yard	*M. A. Downing	M. A. Downing	Indianapolis, Ind
Bennington & Rutland	F. C. White	F. C. White	Rutland, Vt.
Boston, Revere Beach & Lynn	E. H. Whorf		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass.
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & New York Air Line	Jos. H. Franklin		New Haven, Conn.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston Concord & Montreal	*J. A. Dodge		Plymouth, N. H.
Bosta, Concord & Montreal	§W. A. Stowell	J. Thomas Vose	Boston, Mass.
Boston, Hoosac Tunnel & Western	J. L. Wells	gton	Mechanicsville, N.Y.
Boston & Maine	J. T. Furber	J. T. Furber	Boston, Mass.
Boston & Lowell	C. E. A. Bartlett	F. H. Norse	Boston, Mass.
Boston, Barre & Gardner	H. M. Witter	H. M. Witter	Worcester, Mass.
Bradford, Bordell & Kinzua	B. C. Williams	B. C. Williams	Bradford, Pa.
Brooklyn, Flatbush & Coney Isl'd.	Robert White		Brooklyn, N. Y.
Brunswick & Albany	R. D. Meader		Brunswick, Ga.
Burlington & Mo. River (in Neb.)	*A. E. Touzalin	G. Hargreaves	Omaha, Neb.
Burlington & Mo. River (in Neb.)	Geo. W. Holdrege		Omaha, Neb.
First Division	J. O. Phillipi		Lincoln, Neb.
Burlington, Cedar Rapids & Nor'n.	C. J. Ives	Theo. Stickney	Cedar Rapids, Ia.
Burlington & Northwestern	John F. Gerry	John F. Gerry	Burlington, Ia.
Burlington & Southwestern	J. W. Smith	J. W. Smith	Burlington, Ia.
Buffalo & Southwestern	*John F. Moulton		Buffalo, N. Y.
Buffalo, New York & Philadelphia	Geo. S. Gatchell	J. H. Pool	Buffalo, N. Y.
C			
Cairo & St. Louis	Chas. Hamilton	Chas. Hamilton	St. Louis, Mo.
Cairo & Vincennes	Roswell Miller	G. H. Lyman	Cairo, Ill.
California Northern	‡J. A. Fillmore		Sacramento, Cal.
Camden & Atlantic	F. A. Lister	F. A. Lister	Camden, N. J.
Canadian Pacific	*Archer Baker		Brockville, Can.
Canada Southern	*Wm. P. Taylor		Buffalo, N. Y.
Canada Southern		A. F. Howland	St. Thomas, Ont.
U. S. Division	E. P. Murray		Toledo, O.
Canada Division	W. E. Carroll		St. Thomas, Ont.
Cape Fear & Yaukin Valley	L. C. Jones		Fayetteville, N. C.
Canadian Pacific	A. B. Stickney	Geo. P. Nelson	Winnepeg, Man.
Carolina Central	V. Q. Johnson	C. H. Roberts	Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Southern	W. Stevenson		Sayre, Pa.
Cayuga & Susquehanna	R. R. Humphreys		Ithaca, N. Y.
Central Pacific	*A. N. Towne		San Francisco, Cal.
Central Pacific	J. A. Fillmore		San Francisco, Cal.
Central Pacific		J. R. Watson	Sacramento, Cal.
Western & Visalia Divisions	A. D. Wilder		Oakland, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humboldt Division	G. W. Coddington		Carlin, Nev.
Salt Lake Division	A. G. Fell		Ogden, Utah
Sacramento & Oregon Div.	R. H. Pratt		Sacramento, Cal.
Central Vermont	J. W. Hobart		St. Albans, Vt.
Central Vermont	‡J. M. Foss		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Northern Division	J. B. Fuhrboys		St. Johns, P. Q.
Rutland Division	J. Burdett		Rutland, Vt.
New London Northern	G. W. Bentley	G. W. Bentley	New London, Conn.
Central of Georgia	Wm. Rogers	Henry Yonge	Savannah, Ga.
Atlanta Division	W. F. Shellman		Macon, Ga.
Central Iowa	D. N. Pickering	D. N. Pickering	Marshalltown Ia.
Central of New Jersey	James Moore	B. W. Burnett	Elizabeth, N. J.
Central Division	‡W. W. Stearns		Elizabeth, N. J.
Lehigh & Susq. Division	W. S. Polhemus		Mauch Chunk, Pa
Charleston & Savannah	C. S. Gadsden		Charleston, S. C.
Charlotte, Columbia & Augusta	G. R. Talcott	G. R. Talcott	Columbia, S. C.
Chattarol	C. H. R ckwell	Geo. S. Richardson	Ashland, Ky.
Chesapeake & Ohio	*C. W. Smith		Richmond, Va.
Chesapeake & Ohio	W. M. S. Dunn	A. S. Emmons	Richmond, Va.
Cherawa & Darlington	J. F. Divine		Society Hill, S.
Cherokee	John Postell		Atlanta, Ga.
Cheshire	*E. Stewart	H. H. Stone	Keene, N. H.
Chester & Lenoir	James Mason		Chester, S. C.
Chicago & Northwestern	*Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Chicago & Northwestern	J. D. Layng		Chicago, Ill.
Wisconsin & Mill. Division	E. J. Cuyler		Chicago, Ill.
Peninsula Division	W. B. Lindsay		Escanaba, Mich
Madison Division	C. A. Swetford		Baraboo, Wis.
Galena Division	Chas. Murray		Chicago, Ill.
Des Moines & Iowa Division	J. M. Whitman		Clinton, Iowa.
Winona & St. Peter Division	C. Sanborn		Winona, Minn.
Dakota Central Division	T. J. Nichols		Huron, Dak.
Galena & Wisconsin Br.	J. B. Trull		Galena, Ill.
Chicago & Alton	*J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago & Alton	§§C. H. Chappell		Chicago, Ill.
Chicago Division	A. M. Richards		Chicago, Ill.
Kansas City St. Louis Div.	O. Vaughan		Slater, Mo.
Chicago & Block Coal	*A. F. Beach		Veedersburg, Ind.
Chicago, Burlington & Quincy	*Thos. J. Potter	Wm. Irving	Chicago, Ill.
Illinois Divisions	John D. Besler		Galesburg, Ill.
Middle, Galesb'g & Q'y Div	F. C. Rice		Galesburg, Ill.
St. Louis & R. Isl'd Division	W. R. Crumpton		St. Louis Mo.
Iowa Division	E. H. Wade		Burlington, Iowa.
Chicago & Eastern Illinois	O. S. Lyford	O. S. Lyford	Chicago, Ill.
Chicago & Iowa	W. H. Holcomb, *Rec*		Rochelle, Ill.
Chicago, St. Louis & New Orleans	*J. C. Clarke	J. C. Febiger, Jr.	New Orleans, La.
South Division	W. P. McKinley		McComb City, Miss
North Division	J. G. Mann		Jackson, Tenn.
Chicago, Rock Island & Pacific	A. Kimball		Chicago, Ill.
Chicago, Rock Island & Pacific	*R. R. Cable	F. A. Marsh	Chicago, Ill.
Southwestern Division	G. F. Walker		Trenton, Mo.
Iowa Division	H. F. Royce		Des Moines, Iowa.
Illinois Division	R. H. Chamberlin		Chicago, Ill.
Keokuk & Des Moines Div.	John Given		Keokuk, Ia.
Chicago & West Michigan	§C. M. Lawler		Keokuk, Ia.
Chicago, Milwaukee & St. Paul	*S. S. Merrill		St. Joseph, Mich.
Chicago, Milwaukee & St. Paul	W. C. Van Horne	J. T. Crocker	Milwaukee, Wis.
Dubuque Division	J. H. Jenkins		Milwaukee, Wis.
Chicago & Western Div.	H. C. Atkins		Dubuque, Iowa.
Northern Division	L. B. Rock		Milwaukee, Wis.
Minn. & Dakota Division	C. H. Prior		Milwaukee, Wis.
Western Union Division	D. A. Olin		Minneapolis, Minn.
Sioux City & Dak. Div.	G. W. Sanborn		Racine, Wis.
Southern Minnesota Div.	J. M. Egan		Sioux City, Ia.
Chicago, Pekin & Southwestern	J. Murray	A. H. Cook	La Crosse, Wis.
Chicago, St. Paul, Minn. & Omaha	Chas. F. Hatch	W. H. S. Wright	Chicago, Ill.
Nebraska Division	G. Y. Morford		St. Paul, Minn.
Cincinnati Northern	*C. W. Bradley		Omaha, Neb.
Cincinnati & Eastern	George H. Wilber		Cincinnati, O.
Cincinnati, Wabash & Michigan	*Norman Beckley	Norman Beckley	Batavia, O.
Cincinnati, Wabash & Michigan	O. W. Lamport		Elkhart, Ind.
Cincinnati, Hamilton & Dayton	J. H. Barrett	C. M. Woodward	Wabash, Ind.
Cin., Hamilton & Indianapolis	Lewis Williams		Cincinnati, O.
Cincinnati Southern	Sam'l Woodward	Julius Uhlein	Cincinnati, O.
Cin., Indianapolis, St. Louis & Chi.	J. W. Sherwood		Cincinnati, O.
Cin., Indianapolis, St. Louis & Chi.		George Tozzer	Indianapolis, Ind
Cleve., Col., Cin. & Indianapolis	*E. B. Thomas	J. L. Yale	Cincinnati, O.
Indianapolis Division	John O. Ewan		Cleveland, O.
Col. and Cincinnati Divs.	Robert Blee		Union, Ind
Cleveland & Marietta	S. C. Baldwin	R. B. Hoover	Cleveland, O.
Cleveland & Pittsburg	John Thomas		Marietta, Ohio.
Cleveland & Pittsburg	*J. D. Layng	Wm. Mullins	Cleveland, O.
Cleveland, Mt. Vernon & Columb's	G. A. Jones		Pittsburg, Pa.
Cleve., Tuscarawas Val. & Wheel.	*Oscar Townsend		Mt. Vernon, O.
Cobourg, Peterboro & Marmora	James R. Barber	J. R. Barber	Cleveland, O.
Columbia & Greenville	T. M. R. Talcott		Cobourg, Ont.
Columbia & Greenville	J. W. Fry		Richmond, Va.
Columbus, Hocking Valley & Tol.	Geo. R. Carr	Geo. R. Carr	Columbia, S. C.
Columbus & Rome	T. J. Nuckolls		Columbus, O.
Concord & Claremont	George E. Todd		Columbus, Ga.
Concord	H. E. Chamberlin	H. E. Chamberlin	Concord, N. H.
Concord & Portsmouth	H. E. Chamberlin		Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Concord, N. H.
Connecticut Valley	Samuel Babcock		Springfield, Mass.
Connecticut Western	J. F. Jones		Hartford, Conn.
Connecticut & Passumpsic Rivers	H. E. Folsom		Hartford, Conn.
Corning, Cowanesque & Antrim	A. H. Gorton	Andrew Beers	Lyndonville, Vt.
Connellsville Valley	*C. G. Patterson		Corning, N. Y.
Credit Valley	H. G. Taylor		Canton, O.
Cumberland Valley	J. F. Boyd	O. N. Lull	Toronto, Ont.
Cumberland & Pennsylvania	L. Burwell	P. L. Burwell	Chambersburg, Pa.
Cumberland & Maurice River	L. H. Dowdney		Cumberland, Md.
			Port Norris, N. J.
D			
Danbury & Norwalk	L. W. Sandiforth		South Norwalk, C.
Danville & Southwestern	James A. Eads		Paris, Ill
Danville, Olney & Ohio River	J. M. Graham		Kansas, Ill.
Dayton & Michigan	E. E. Dwight		Toledo, O.
Dayton & Union	J. C. Gale		Indianapolis, Ind.
Delaware & Chesapeake	O. S. Sanford		Easton, Md.
Delaware & Hudson Canal Co.	R. Manville	R. Manville	Carbondale, Pa.
Delaware & Hudson Canal Co.	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	C. D. Hammond		Albany, N. Y.
Rensselaer & Saratoga Div.	Theo. Voorhees		Troy, N. Y.
Delaware, Lackawanna & Western		G. W. B. Cushing	New York City.
Delaware, Lackawanna & Western	W. F. Hallstead		Scranton, Pa.
Bloomsburg Division	G. Bogart		Scranton, Pa.
Morris & Essex Division	Andrew Reasoner		Hoboken, N. J.
Oswego & Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Div	F. J. Griffiths		Scranton, Pa.
Delaware Western	David Connell		Wilmington, Del.
Denver & Rio Grande	*D. C. Dodge		Denver, Col.
Denver & Rio Grande	George W. Cushing		Denver, Col.
Denver & Rio Grande		A. B. Garner	Colorado Spr'g, Col.
First Division	M. C. Kimberly		Pueblo, Col.
Second Division	W. H. Bancroft		Alamosa, Col.
Des Moines, north western	H. H. Sieel		Des Moines, Iowa.
Des Moines & Ft. Dodge	C. N. Gilmore	C. N. Gilmore	Des Moines, Iowa.
Detroit, Gr. Haven & Milwaukee	W. J. Morgan	John S. Lorimer	Detroit, Mich.
Detroit, Hillsdale & Southwestern	W. F. Parker		Ypsilanti, Mich.
Detroit, Lansing & Northern		Allan Bourn	Detroit, Mich.
Detroit, Lansing & Northern	T. M. Fish		Ionia, Mich.
Detroit, Mackinac & Marquette	James McMillan		Detroit, Mich.
Dorchester & Delaware	Thos. E. Wright		Cambridge, Md.
Dubuque & Dakota	A. C. Goodrich		Waverly, Iowa.
Dunkirk, Allegheny Val. & Pitts	D. Thayer		Dunkirk, N. Y.
Dunkirk, Allegheny Val. & Pitts		R. C. Moore	New York City.
E			
East Broad Top	A. W. Sims		Orbisonia, Pa.
East Alabama	W. W. Barnes		Opelika, Ala.
East Line & Red River	W. B. Ward		Jefferson, Tex.
East St. Louis & Carondelet	J. W. Jones		E. St. Louis, Ill.
East Tenn., Virginia & Georgia	*J. F. O'Brien	J. Y. Johnston	Knoxville, Tenn.
Selma Division	John M. Bridges		Selma, Ala.
N. Carolina Division	W. J. Taylor		Knoxville, Tenn.
Ohio Division	G. J. Kinzel		Knoxville, Tenn.
Alabama Central Division	J. M. Bridges		Selma, Ala.
Macon & Brunswick Div.	J. M. Edwards		Macon, Ga.
Eastern	**D. W. Sanborn	Geo. J. Fisher	Boston, Mass.
Eastern Kentucky	*H. W. Bates	H. W. Bates	Riverton, Ky.
Eastern Shore	W. Thompson		Prince Anne, Md.
Elizabeth City & Norfolk	*Morris K. King		Norfolk, Va.
Erie & Pittsburg	*J. D. Layng	Wm. Mullins	Pittsburg, Pa.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
European & Pallisade	P. Evarts		Pallisade, Nev.
European & North American	F. W. Cram		Bangor, Maine.
Evansville & Terre Haute	C. J. Hepburn	Jno. L. White	Evansville, Ind.
Evansville, Rockport & Eastern	G. C. Weaver		Evansville, Ind.
F			
Fitchburg	John Adams	F. S. Pratt	Boston, Mass.
Vermont & Mass. Div.	‡E. K. Turner		Fitchburg, Mass
Flint & Pere Marquette	Sanford Keeler	G. G. Cook	E Saginaw, Mich.
Eastern Division	W. F. Potter		E. Saginaw, Mich.
Western Division	Y. Meredith		E. Saginaw, Mich
Florida Central	W. M. Davidson	W. M. Davidson	Jacksonville, Fla.
Florida Southern	N. R. Gruelle		Palatka, Fla.
Fonda, Johnstown & Gloversville	L. Caten		Gloversville, N. Y
Fon du Lac, Amboy & Peoria	A. Kinyon		Fond du Lac, Wis.
Fort Madison & Northwestern	S. B. Kenrick	S. B. Kenrick	Fort Madison, Ia
Fort Wayne & Jackson	M. D. Woodford	M. D. Woodford	Jackson, Mich.
Fort Wayne, Muncie & Cincinnati	W. W. Worthington	P. Ag't	Fort Wayne, Ind.
Frankfort & Kokomo	A. W. Hazelrigg	E. H. Andress	Lafayette, Ind.
Fredericton	F. B. Edgecombe		Fredericton, N. B.
Freehold & New York	J. E. Ralph	J. E. Ralph	Freehold, N. J.
G			
Gal., Harrisburg & San Antonio	James Converse		Houston, Texas.
Gal., Harrisburg & San Antonio		Chas. Babbidge	Boston, Mass.
Gal., Houston & Henderson	*W. H. Harding	W. H. Harding	Galveston, Texas.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Geneva, Ithaca & Sayre	Wm. Stevenson		Sayre, Pa.
Georgia	*John W Green		Augusta, Ga.
Grand Haven	Geo. C. Kimball	H. Park	Allegan, Mich.
G. Rapids, Newaygo & L. Shore	A. M. Nichols	H. Park	G. Rapids, Mich.
Grand Rapids & Indiana	W. O. Hughart, Pres't.	W. R. Shelby	G. Rapids, Mich.
Northern Division	J. M. Macheany		G. Rapids, Mich.
Southern Division	P. S. O'Rourke		Fort Wayne, Ind.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
Grand Trunk	W. J. Spicer		Montreal, Canada.
Chicago Division	S. R. Callaway		Chicago, Ill.
Grand Tower & Carbondale	T. M. Williamson	Wm. W. Harris	Grand Tower, Ill.
Great Western (Canada)	Charles Stiff		Hamilton, Ont.
Great Western (Canada)		G. R. Nash	London, Ont.
Greca Bay, Winona & St. Paul	*Timothy Case		Green Bay, Wis.
Greenville, Col. & Birmingham	E. P. Buell		Greenville, Miss.
Greewich & Johnsonville	J. H. Thompson		Greenwich, N. Y.
Gulf, Colorado & Santa Fé	*John Sealey	F. P. Killeen	Galveston, Texas.
Gulf, Western Texas & Pacific	M. D. Monserrate		Cuero, Texas.

H

Hannibal & St. Joseph	*John B. Carson	T. L. Dunn	Hannibal, Mo.
Eastern Division	W. R. Woodard		Hannibal, Mo.
Hanover Junction & Gettysburg	Henry A. Young	H. A. Young	Hanover, Pa.
Harlem Extension South	*R. C. Root		Bennington, Vt.
Hartford & Connecticut Valley	Samuel Babcock		Hartford, Conn.
Havana, Rantoul & Eastern	H. E. Bullock		Rantoul, Ill.
Housatonic	L. B. Stillson		Bridgeport, Conn.
Houstn. East & West Texas			Houston, Texas.
Houston & Texas Central	A. H. Swanson	A. H. Swanson	Houston, Texas.
Southern Division	M. G. Howe		Houston, Texas.
Northern Division	G. A. Quinlan		Corsicana, Texas.
Huntingdon & Broad Top	Geo. F. Gage	S. B. Knight	Huntington, Pa.

I

Illinois Central	E. T. Jeffrey	O. Ott	Chicago, Ill.
Chicago Division	T. J. Hudson		Chicago, Ill.
Middle Division	H. L. Frisbie		Pontiac, Ill.
Northern Division	J. C. Jacobs		Amboy, Ils.
Iowa Division	D. W. Parker		Dubuque, Ia.
Springfield Division	Wm. Wilkinson		Springfield, Ill.
Illinois Midland	L. Genis, *Rec.*		Terre Haute, Ind.
Illinois & St. Louis	C. H. Sharman		St. Louis Mo.
Indiana, Bloomington & Western	§C. E. Henderson	H. C. Norton	Indianapolis, Ind.
Ohio Division	D. W. C. Brown		Sandusky, Ohio.
Indianapolis, Decatur & Spring.	F. L. Peck		Indianap'ls, Ind.
Indianapolis & St. Louis	C. C. Gale	H. W. Comstock	Indianapolis, Ind.
Indianapolis, Peru & Chicago	*V. T. Malott		Indianapolis, Ind.
Indianapolis, Peru & Chicago		John Mc Kenna	Peru, Ind.
Indianapolis & Vincennes	J. J. Turner		Indianapolis, Ind
Intercolonial	D. Pottinger	T. V. Cooke	Moncton, N. B.
Halifax & St. John Division	Jas. Coleman		Truro, N. S.
Northern Division	M. Busby		Campbell'n, N. B.
International & Great Northern	*H. M. Hoxie	R. B. Lyle	Palestine, Texas.
San Antonio Division	Jos. Hutcheson		San Antonio, Tex.
Gulf Division	R. H. Pegram		Houston, Texas.
Iowa Eastern	H. H. Kerr		Beulah, Iowa
Iron Mountain & Helena	Z. Harris		Helena, Ark.

J

Jacksonville, N. Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pen. & Mobile	C. H. Allen	J. D. Hollister	Tallahasee, Fla.
Jacksonville & Southeastern	E. S. Greenleaf		Jacksonville, Ill.
Jeff., Madison & Indianapolis	E. W. McKenna		Louisville, Ky.
Jeff., Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Junction & Breakwater	Tho. Groome		Lewes, Del.

K

Kansas Central	W. A. Martin	W. A. Martin	Leavenworth, Kan
Kan. City, Burlington & Santa Fe	James Houston		Burlington, Kan.
Kansas City, Fort Scott & Gulf	L. W. Towne	H. P. Jacques	Kansas City, Mo.
Kansas City, Lawrence & South.	L. W. Towne	H. P. Jacques	Kansas City, Mo.
Kan. City, St. Joseph & C. Bluffs	J. F. Barnard		St. Joseph, Mo.
Kent Co. & Smyrna & Del. Bay	J. F. Bingham		Chestertown, Md.
Kentucky Central	*J. D. Ellison		Covington, Ky.
Kingston & Pembroke	B. W. Folger	Wm. Harty	Kingston, Can.
Knox & Lincoln	C. A. Coombs	C. A. Coombs	Bath, Maine.

L

Lake Erie & Western	*E. H. Waldron	E. H. Andress	Lafayette, Ind.
Sandusky Division	D. S. Hill		Fremont, Ohio.
Bloomington Division	J. B. Clark		LaFayette, Ind.
Lake Ontario Southern	Jas. H. Briggs		Newark, N. Y.
Lake Shore & Mich. Southern	*John Newell		Cleveland, Onio.
Lake Shore & Mich. Southern		A. C. Armstrong	Cleveland, Ohio.
Buffalo & Erie Division	C. B. Couch		Cleveland, Ohio.
Toledo Divison	Thos. Flesher, Jr.		Cleveland, Ohio.
Michigan Division	J. E. Curtis		Toledo, Ohio.
Detroit Division	T. J. Charlesworth		Detroit, Mich.
Western Division	J. H. Parsons		Chicago, Ill.
Lansing Division	W. H. Caniff		Lansing, Mich.
Franklin Division	Geo. H. Hulitre		Stoneboro, Pa.
Lebanon Springs	*W. C. Van Alstyne.		Albany, N. Y.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
Lehigh Valley		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahanoy Division			Mauch Chunk, Pa.
New Jersey Division			Metuchen, N. J.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Levis & Kennebec	W. C. Hall		Quebec, Can.
Ligonier Valley	Thos. A. Mellon		East Liberty, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Little Rock, Miss. River & Texas	J. A. Woodson	J. A. Woodson	Little Rock, Ark.
Los Angeles & Independence	W. J. L. Moulton		Los Angeles, Cal.
Long Island	Austin Corbin, *Rec.*		L'g Isla'd C'y, N. Y
Louisiana Western	C. A. Burton		Houston, Tex.
Louisville & Nashville	F. de Funiak		Louisville, Ky.
Louisville & Nashville	D. W. C. Rowland		Louisville, Ky.
St. L. & S. E. & N. & D. Div.	James Montgomery	J. N. McCoy	Evansville, Ind.
Memphis Line	J. E. Harahon		Memphis, Tenn.
Nashville & Decatur Div	James Geddes		Nashville, Tenn.
So. & North Ala. Division	E. Marsh		Birmingham, Ala.
Mobile & New Orleans Div			Mobile, Ala.
Louisville, Cincinnati & Lexington	Wm. Mahl	Wm. Mahl	Louisville, Ky.
Louisville, New Albany & Chicago	John McLeod	Wm. M. Lewis	Louisville, Ky.
Louisville, N. Albany & St. Louis	J. Martin		New Albany, Ind.

M

Maine Central	Payson Tucker		Portland, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Manchester & North Weare	H. E. Chamberlin		Concord, N. H.
Manchester & Keene	B. F. George		Keene, N. H.
Manhattan Beach	A. Corbin, *Pres't.*		New York, N. Y.
Manhattan Elevated	*Frank K. Hain	James Tobin	New York, N. Y.
Manhattan Elevated	C. L. Green		New York, N. Y.
Marietta & Cincinnati	Jas. H. Stewart.	J. H. Stewart	Cincinnati, O.
Marquette, Hought'n & Ontonag'n	*Samuel Schoch	R. M. McCauley	Marquette, Mich.
McKean & Buffalo	S. V. Godden		Smethport, Pa.
Memphis & Little Rock	*Wm. E. Smith	W. E. Smith	Memphis, Tenn.
Memphis & Little Rock	E. K. Sibley		Memphis, Tenn.
Memphis & Charleston	John A. Grant	John A. Grant	Huntsville, Ala.
Memphis, Paducah & Northern	*N. Monserrat	N. Monserrat	Paducah, Ky.
Mexican National	*G. Clinton Gardner	A. R. Roberts	New York, N. Y.
Michigan Air Line	*M. S. Hadley		Romeo, Mich.
Michigan Central	*H. B. Ledyard	Allan Bourn	Detroit, Mich.
Michigan Central	E. D. Brown		Jackson, Mich.
Mackinaw & Saginaw Div	W. A. Vaughan		Bay City, Mich.
Main L'e & G. R.& Kal. Div's.	C. B. Bush		Jackson, Mich.
Detroit & Bay City Div	W. A. Vaughan		Bay City, Mich.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Western Division	F. C. Nicholas		Chicago, Ill.
Middleburg & Schoharie	P. S. Demforth		Middleburg, N.Y.
Middletown & Crawford	D. Thompson		Thompson, Ridge, N.Y.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Milwaukee, Lake Shore & West'n	H. G. H. Reed		Milwaukee, Wis.
Mineral Range	*C. E. Holland		Hancock, Mich.
Minneapolis & St. Louis	*C. H. Hudson		Minneapolis, Minn
Minneapolis & St. Louis	E. Ryder		Minneapolis, Minn.
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Ship Island	A. L. Jaquith		Vicksburg, Miss.
Missisquoi	W. C. Smith		St. Albans, Vt.
Missouri Pacific	A. A. Talmage	R. B. Lyle	St. Louis, Mo.
Missouri Pacific	‡A. W. Dickinson		St. Louis, Mo.
Eastern Division	O. H. Dorrance		St. Louis, Mo.
Central Branch Division	W. W. Fagan		St. Louis, Mo.
Western Division	Warder Cumming		Sedalia, Mo.
Mobile & Alabama Grand Trunk	F. B. Clark, Prest		Mobile, Ala.
Mobile & Ohio	*A. L. Rives	A. L. Rives	Mobile, Ala.
Northern Division	E. S. Hosford		Jackson, Tenn.
Southern Division	C. Fleming		Mobile, Ala.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	Geo. Nason		Montgomery, Ala
Mont Alto	G. H. Weistling		Mont Alto, Pa.
Montgomery & Eufaula	W. F. Shellman		Macon, Ga.
Montpelier & Wells River	W. A. Stowell		Montpelier, Vt.
Montrose	J. I. Blakslee	J. I. Blakslee	Mauch Chunk, Pa.
Morgan's Louisiana & Texas	Geo. Pandeley	C. A. Whitney & Co.	New Orleans, La.
Muncy Creek	H. R. Mehrling		Hughesville, Pa.

N

Nashua, Acton & Boston	H. E. Chamberlin		Concord, N. H
Nashua & Lowell	Chas. E. Paige	Chas. E. Paige	Nashua, N. H.
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn
Natchez, Jackson & Columbus	J. H. Fitzpatrick		Natchez, Miss.
Naugatuck	Geo. W. Beach	Geo. W. Beach	Waterbury, Conn.
Nevada County	John F. Kidder,		Grass Valley, Cal.
Nebraska	Wm. Irving		Omaha, Neb.
Nevada Central	F. W. Dunn	F. W. Dunn	Battle Mountain, Nev.
New Orleans Pacific	H. S. Moore		New Orleans, La.
New Orleans & Selma	L. B. Scofield		Selma, Ala.
Newburg, Dutchess & Connecticut	C. L. Kimball	C. L. Kimball	Dutchess J'n, N.Y.
New Brunswick & Canada	John Stewart		St. Stephen, N. B.
New Brunswick	E. R. Burpee	Alfred Feely	Gibson, N. B.
New Canaan	Wm. St. John		New Canaan, Conn.
New Castle & Oil City	A. Vandivort		New Castle, Pa.
New Haven & Derby	E. S. Quintard		New Haven, Conn.
New Haven & Northampton	C. A. Goodnow	C. N. Yeamans	New Haven, Conn.
New Jersey & New York	J. D. Hasbrouck		Jersey City, N. J.
New Jersey Southern	Rufus Blodgett		110 Lib. st., N. Y.
New York City & Northern	F. S. Gannby		High Bridge, N. Y.
New York, Chicago & St. Louis	*Lewis Williams		Cleveland, O.
New York, Chicago & St. Louis	H. L. Morrill		Cleveland, O.
Western Division	M. E. Wattles		Wanatah, Ind.
Middle Division	C. H. Cory		Fostoria, O.
New York, Lake Erie & Western	*Robert Harris		New York, N. Y.
New York, Lake Erie & Western	E. S. Bowen	J. A. Hardenbergh	New York, N. Y.
New York, Lake Erie & Western	‡Benj. Thomas		New York, N. Y.
New York, Lake Erie & Western	*‡P. P. Wright		Jersey City, N. J.
Eastern Division	S. O. Hill		Port Jervis, N. Y.
Delaware Division	Chas. Neilson		Port Jervis, N. Y.
Susquehanna Division	R. B. Cable		Elmira, N. Y.
Buffalo & Rochester Div	R. G. Taylor		Buffalo, N. Y.
Western Division	J. S. Beggs		Dunkirk, N. Y.
New York & Greenwood Lake	Geo. Hill		Pompton, N. J.
New York, New Haven & Hartford	*E. M. Reed	R. N. Dowd	New Haven, Conn.
N. Y. & N. H. Division	John T. Moody		New York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Conn.
Shore Line Division	W. H. Stevenson		New Haven, Conn.
New York Central & Hudson Riv.	John M. Toucey	R. C. Moore	New York, N. Y.
Hudson River & Harlem Div	C. M. Bissell		New York, N. Y.
Eastern Division	Zenas C. Priest		Albany, N. Y.
Western Division	Geo. H. Burrows		Buffalo, N. Y.
New York Central Division	Jas. Tillinghast		Albany, N. Y.
New York & New England	*Jas. H. Wilson	W. W. McKim	Boston, Mass.
Eastern Division	O. M. Shepard		Boston, Mass.
Norwich Division	P. St. M. Andrews		Norwich, Conn.
Western Division	J. C. Rawn		Hartford, Conn.
Providence Division	L. W. Palmer		Providence, R. I.
New York & Sea Beach	*C. W. Douglas		110 B'y, New York.
New York & Sea Beach	W. A. Sheldon		Bay Ridge, L. I.
New York, Ontario & Western	Jas. E. Childs		Middletown
Middle Div	N. B. Hankin	Charles Clark	Middletown, N. Y.
Northern Division	C. W. Lanpher		Norwich, N. Y.
Southern Division	A. H. Danforth		Middletown, N. Y.
New York, Penn. & Ohio	P. D. Cooper	J. H. Holway	Cleveland, O.
First & Second Divisions	A. L. Dunbar		Meadville, Pa.
Third and Fourth Divisions	T. A. Phillips		Galion, O.
Mahoning Division	J. M. Ferris		Cleveland, O.
New York, Providence & Boston	J. B. Gardiner		Providence, R. I.
New York, Providence & Boston		Giles F. Ward	Stonington, Conn.
New York, Susquehanna & West	*H. M. Britton		New York, N. Y.
N. Y. Woodhaven & Rockaway	J. M. Lunt		Hunter's Pt., L. I.
Norfolk & Western	*Henry Fink	J. P. Minetree	Petersburg, Va.
Northern Pacific	*Herman Haupt	E. T. Williams	St. Paul, Minn.
Northern Pacific	H. A. Towne		Brainerd, Minn.
Pacific & P. Oreille Div	J. W. Sprague	J. W. Sprague	New Tacoma, W. T
Missouri Division	D. R. Taylor		Mandon, Dak.
Dakota Division	C. T. Hobart		Fargo, Dak.
North Carolina	See Piedmont Air Line.		
Northern Central			Philadelphia, Pa.
Northern Central	*Frank Thomson		Baltimore, Md.
Northern Central	Robt. Neilson	A. W. Sumner	Shamokin, Md.
Shamokin Division	A. B. Starr		Shamokin, Md
Elmira & Canandaigua Div	Spencer Meade		Elmira, N. Y.
Susquehanna Division	Tho. Gucker		Williamsport, Pa.
Northern (New Hampshire)	George E. Todd		Concord, N. H.
Northeastern (Georgia)	H. R. Bernard		Athens, Ga.
Northeastern (South Carolina)	J. F. Devine		Charleston, S. C.
North Pacific Coast	W. C. Fillmore	W. F. Russell	San Francisco, Cal.
Northwestern Ohio	J. S. Morris		Toledo, O.
Northern & Northwestern	Jas. Webster		Toronto, Can.

O

Ogdensburg & Lake Champlain	*A. A. Gaddis		Malone, N. Y.
Ogdensburg & Lake Champlain	A. Klohs		Malone, N. Y.
Ohio Central	*G. G. Hadley	F. W. Stewart	Columbus, O.
Ohio Central	F. W. Stewart		Toledo, O.
Ohio & Mississippi	W. W. Peabody	G. E. Atwood	Cincinnati, O.
Eastern Division	C. B. Cole		Seymour, Ind.
Western Division	C. M. Stanton		St. Louis, Mo.
Louisville Division	C. Cole		Louisville, Ky.
Ohio Southern	*C. E. Henderson		Indianapolis, Ind.
Ohio & West Virginia	Geo. R. Carr		Columbus, Ohio.
Old Colony	J. R. Kendrick	R. W. Husted	Boston, Mass.
Northern Division	§S. A. Webber		Fitchburg, Mass
Cape Cod Division	C. H. Nye		Hyannis Mass.
Main Line Division	§J. H. French		Boston, Mass.
Olean, Bradford & Warren	J. W. Watson		Olean, N. Y.
Olean Bradford & Warren		J. H. Poole	Buffalo, N. Y.
Omaha & Republican Valley	P. J. Nichols		Omaha, Neb.
Omaha & Northern Nebraska	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr	J. Brandt, Jr	Portland, Oregon.
Oregon Railway & Navigation Co	G. J. Ainsworth	J. M. Drake	Portland, Oregon.
Oregonian	J. M. Fillmore		Portland, Oregon.
Owensboro & Nashville	W. L. Gude		Owensboro, Ky.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
P			
Paducah & Elizabethtown	Robert Meek		Elizabethtown Ky
Painesville & Youngstown	*Geo. M. Patten		Painesville, O.
Painesville & Youngstown	J. A. Newcomb		Painesville, O.
Parker & Karns City	W. C. Moberly		Parker City, Pa.
Peach Bottom	S. M. Manifold		York, Pa.
Paw Paw & Toledo & South Haven	John Ihing		Lawton, Mich.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Pennsylvania	Charles E. Pugh		Altoona, Pa.
Pennsylvania	**John Reilly		Altoona, Pa.
Frederick Division	J. B. Hutchinson		York, Pa.
New York Division	James McCrea		Jersey City, N. J.
Amboy Division	I. S. Buckelew		Camden, N. J.
Belvidere Division	J. A. Anderson		Lambertville, N. J.
New Jersey Division	F. Wolcott Jackson		Jersey City, N. J.
Philadelphia Division	S. M. Provost		Philadelphia, Pa.
Middle Division	H. H. Carter		Harrisburg, Pa
Pittsburg Division	Robert Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	Tho. A. Roberts		Harrisburg, Pa.
West Pennsylvania Division	A. P. Kinkaid		Allegheny City, Pa.
Lewistown Division	Wm. M. Phillips		Lewistown, Pa.
Altoona Division	Wm. J. Latta		Altoona, Pa.
Pensacola & Selma	Geo. Nason		Pensacola, Fla.
Peoria, Decatur & Evansville	G. R. Cobleigh	G. R. Cobleigh	Peoria, Ill.
Perkiomen	D. B. Clack		Norristown, Pa.
Petersburg	R. Sulby	L. E. Clark	Petersburg, Va.
Philadelphia & Atlantic City	Ellis Clark	Ellis Clark	Philadelphia, Pa.
Philadelphia & Reading	*J. E. Wootten	W. S. Wilson	Philadelphia, Pa.
Catawissa & Williamsport Br.	D. C. Reinhart		Williamsport, Pa.
Reading & Columbia	Alex. M. Wilson		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
N. Penn. & R. Brook Div'n.	F. A. Sweigard		Philadelphia, Pa.
Philadelphia & Erie	Robert Neilson		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	E. B. Westfall		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Danv., Haz. & W. Barre Div.	Joseph Crawford		Sunbury, Pa.
Philadelphia, Wilmington & Balt.	H. F. Penney	Enoch Lewis	Philadelphia, Pa.
Central Division	C. K. Lodge		Philadelphia, Pa.
Philadelphia, Newt'n & New York	L. L. Bush		Philadelphia, Pa.
Piedmont Air-Line	T. M. R. Talcott	R. H. Duesberry	Richmond, Va.
Richmond & Danville Div	W. A. Green		Richmond, Va.
North Carolina Division	A. B. Andrews		Raleigh, N. C.
Atlanta & Charlotte Div	I. Y. Sage		Atlanta, Ga.
Pinconning	Wm. Mercer		Bay City, Mich.
Pittsburg Southern	Jos. Ramsey, Jr.		Pittsburg, Pa.
Pittsburg & Castle Shannon	A. C. Hays		Pittsburg, Pa.
Pittsburg & Lake Erie	R. W. Jones		Pittsburg, Pa.
Pittsburg, Cincinnati & St. Louis	*D. W. Caldwell		Pittsburg, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr.	William Mullins	Pittsburg, Pa.
Pitts., Cin. & St. Louis Div	E. B. Taylor		Dennison, O.
Col., Cin. & Ind., Cent. Div.	C. C. F. Bent		Logansport, Ind.
Col., Chi. & Ind., Cent. Div.	J. F. Miller		Richmond, Ind.
Indianap. & Vincennes Div.	E. W. McKenna		Indianapolis, Ind.
Cincin. & Musk. Valley Div	Wm. F. Black		Zanesville, O.
Little Miami Div	Ralph Peters		Cincinnati, O.
Pittsburg, Bradford & Buffalo	M. Mandeville		Foxburg, Pa.
Pittsburg, Ft. Wayne & Chicago	D. W. Caldwell	William Mullins	Pittsburg, Pa.
Pittsburg, Ft. Wayne & Chicago	C. E. Gorham		Chicago, Ill.
Eastern Division	George S. Griscom		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Pittsburg & Western	J. R. Bonner		Allegheny, Pa.
Pittsburg, Titusville & Buffalo	Tho. H. Wilson		Oil City, Pa.
Pittsburg, Titusville & Buffalo		John L. Awl	Pittsburg, Pa.
Pittsburg, Virginia & Charleston	J. M. Byers		Pittsburg, Pa.
Port Dover & Lake Huron	A. B. Atwater		Woodstock, Ont.
Port Huron & Northwestern	*I. R. Wadsworth		Port Huron, Mich.
Port Royal & Augusta	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	Jonas Hamilton	Jonas Hamilton	Portland, Me.
Portland & Rochester	G. P. Wescott, *Rec.*		Portland, Me.
Potomac, Fredericksb'h & Pied't	Charles Kennedy		Fredericksb'h, Va.
Poughkeepsie, Hartford & Boston	J. A. Perkins	J. A. Perkins	Poughkeepsie, N Y
Prince Edward Island	L. B. Archibald	L. B. Archibald	Charlotte't'n, P.E.I
Prospect Park & Coney Island	R. Schermerhorn		Coney Island, N Y
Providence & Springfield	William Tinkham	William Tinkham	Providence, R. I.
Providence & Worcester	W. E. Chamberlain		Providence, R. I.
Providence, Warren & Bristol	Waterman Stone		
Q			
Quebec, Mont., Ott'a & Occidental	I. A. Senecal	W. E. Blumhart	Montreal, Can.
Quebec Central	$A. Steele		Sherbrooke, Can.
Queen Anne & Kent County	P. H. Irwin		Centreville, Md.
Quincy, Missouri & Pacific	F. D. Schermerhorn		Quincy, Ill.
R			
Raleigh & Augusta Air-Line	J. C. Winder		Raleigh, N. C.
Raleigh & Gaston	J. C. Winder		Raleigh, N. C.
Rhinebeck & Connecticut	J. H. Jones		Rondout, N. Y.
Richmond, York Riv. & Chesap'ke	H. T. Douglas	B. S. Crouch	Richmond, Va.
Richmond & Allegheny	*Decatur Axtell		Richmond, Va.
Richmond, Frederick'h & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Theo. D. Kline		Richmond, Va.
Rio Grande	*M. J. Gonila		Brownsville, Tex.
Rochester & Pittsburg	Geo. E. Merchant	Geo. E. Merchant	Rochester, N. Y.
Rockwood & Tennessee River	H. Clay Evans		Rockwood, Tenn.
Rock Island & Mercer County	*R. R. Cable		Rock Island, Ill.
Rock Island & Peoria	H. B. Sudlow		Rock Island, Ill.
Rome	Eben Hillyer		Rome, Ga.
Rome, Watertown & Ogdensburg	E. A. Van Horne		Watertown, N. Y.
Rome, Watertown & Ogdensburg		G. W. B. Cushing	New York City.
Rumford Falls & Buckfield	O. Havford		Canton, Me.
S			
St. Croix & Penobscot	Wallace Haycock		Milltown, Me.
St. Lawrence & Ottawa	†Tho. Reynolds	Tho. Reynolds	Ottawa, Can.
St. Johns	R. Mitchell		Jacksonville, Fla.
St. John & Maine	H. D. McLeod		St. John, N. B.
St. Johnsbury & Lake Champlain	A. B. Jewett		St. Johnsbury, Vt.
St. Joseph & Des Moines	J. F. Barnard		St. Joseph, Mo.
St. Joseph & Western	L. D. Tuthill		St. Joseph, Mo.
St. Joseph & Western		A. D. Clarke	Omaha, Neb.
St. Louis, Alton & Terre Haute	Beriah Warren	Beriah Warren	St. Louis, Mo.
St. Louis, Hannibal & Keokuk	W. W. Walker		Hannibal, Mo.
St. Louis, Iron Mountain & South	*H. M. Hoxie	R. B. Lyle	St. Louis, Mo.
Texas Division			Texarkana, Ark.
Missouri Division	Wm. Kerrigan		St. Louis, Mo.
St. Louis & San Francisco	*C. W. Rogers	A. G. Thompson	St. Louis, Mo.
Mo. & Ark. Division	W. A. Thomas		Springfield, Mo.
Kansas Division	J. R. Wentworth		Neodesha, Kan.
St. Louis, Keokuk & Northwest'n	A. L. Griffin	John A. Blood	Keokuk, Ia.
St. Louis, Salem & Little Rock	E. B. Sankey		Salem, Mo.
St. Louis, Salem & Little Rock		H. A. Crawford	St. Louis, Mo.
S Louis Bridge Co. & Tunnel R.R.	J. B. Van Dyne	J. E. Williams, Jr.	St. Louis, Mo.
St. Louis Coal	R. J. Cavedi		Carbondale, Ill.
St. Paul & Duluth	E. Q. Sewell	G. Callahan	St. Paul, Minn.
St. Paul, Minneapolis & Manitoba	*Jas. J. Hill	J. C. Morrison	St. Paul, Minn.
St. Paul, Minneapolis & Manitoba	E. B. Wakeman		St. Paul, Minn.
Fergus Falls Division	J. B. Rice		Minneapolis, Minn.
Minneapolis & Breck. Div	A. Guthrie		Minneapolis, Minn.
Northern Division	C. O. Wheeler		Fergus Falls, Minn.
St. Paul & Sioux City	E. W. Winter		St. Paul, Minn.
Sacramento & Placerville	Josiah Johnson		Sacramento, Cal.
Saginaw Valley & St. Louis	N. W. Merrill	N. W. Merrill	Saginaw, Mich.
San Francisco & North Pacific	H. C. Whiting		Petaluma, Cal.
Savannah, Florida & Western	*H. S. Haines	W. B. McKee	Savannah, Ga.
Savannah, Florida & Western	$F. S. Pendergast		Savannah, Ga.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Savannah & Memphis	*G. J. Foreacre		Atlanta, Ga.
Schuylkill & Lehigh	Eldridge Dale		Slatington, Pa.
Scioto Valley	Joseph Robinson		Columbus, O.
Sciota Valley		C. H. Cory	Portsmouth, O.
Seaboard & Roanoke	J. M. Robinson	J. A. Walton	Baltimore, Md.
Sedalia, Warsaw & Southern	G. H. Huntington		Sedalia, Mo.
Selma & Greensboro	A. M. Fowlkes		Selma, Ala.
Shenango & Allegheny	J. T. Blair		Greenville, Pa.
Shenandoah Valley	J. H. Sands		Hagerstown, Md.
Shepaug	Edwin McNeill		Litchfield, Conn.
Sioux City & Pacific	J. S. Wattles		Missouri Valley, Ia.
Sioux City & Pacific	*P. E. Hall	P. E. Hall	Cedar Rapids, Ia.
Skaneateles	J. McNamara		Skaneateles, N. Y.
South Carolina	John B. Peck	S. B. Pickens	Charleston, S. C.
Southeastern of Canada	H. A. Alden		Newport, Vt.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
South Mountain	W. H. Woodward		Pine Grove Furnace, Pa.
Southern Pacific	A. C. Bassett	John R. Watson	San Francisco, Cal.
Los Angeles & Yuma Div	§E. E. Hewitt		Los Angeles, Cal.
Tulare Division	A. D. Wilder		Oakland, Cal.
South Pacific Coast	F. W. Bowen		San Francisco, Cal.
Southwestern of Georgia	W. G. Raoul		Macon, Ga.
Southwestern of Kentucky	M. Tabler		Harrodsburg, Ky.
Spartanburg, Union & Columbia	Jas. Anderson	Jas. Anderson	Spartanburg, S. C.
Springhill & Parsboro	A. Killam		Parsboro, N. S.
Springfield & Western Missouri	T. F. Oakes		Springfield, Mo.
Spring'd, Effingham & So. East'n	E. P. Buell		Robinson, Ill.
State Line & Sullivan	J. O. Blight		Towanda, Pa.
Staten Island	John W. Wilber		Tottenville, N. Y.
Sterling Mountain	J. C. Missimer		Sloatsburg, N. Y
Summit Branch	R. C. Peebles		Lykens, Pa.
Sussex & Blairstown	A. Reasoner		Newton, N. J.
Sycamore, Cortland & Chicago	Elry Hall		Sycamore, Ill.
Syracuse, Binghamton & N. Y.	W. K. Niver		Syracuse, N. Y.
Syracuse, Binghamton & N. Y.		G. W. B. Cushing	New York, N. Y.
Syracuse, Chenango & New York	Albert Allen		Syracuse, N. Y.
Syracuse, Geneva & Corning	A. H. Gorton	Andrew Beers	Corning, N. Y.
T			
Tennessee & Pacific	J. W. Thomas		Nashville, Tenn.
Terre Haute & Ind'apolis	Col. Josh A. Hill		St. Louis, Mo.
Terre Haute & Ind'apolis	Joshua Staples		Indianapolis, Ind.
Terre Haute & Ind'apolis		C. R. Peddle	Terre Haute, Ind.
Logansport Division			Logansport, Ind.
Terre Haute & Southeastern	George Atherton		Terre Haute, Ind.
Texas & New Orleans	C. A. Burton	P. B. Watson	Houston, Tex.
Texas & Pacific	*H. M. Hoxie	R. B. Lyle	Marshall, Tex.
Jefferson Division	J. S. Noble		Texarkana, Ark.
Southern Division	C. Harris		Marshall, Tex.
Texas Western	J. W. Goodwin		Houston, Tex.
Texas & St. Louis	J. W. Brown		Tyler, Tex.
Tioga	L. H. Shattuck		Blossburg, Pa.
Tioga		Jas. A. Drake	Elmira, N. Y
Toledo, Delphos & Burlington	*F. A. Phillips		Delphos, O.
Toledo, Delphos & Burlington	W. G. Brownson	H. A. Eaton	Delphos, O.
Dayton Division	J. O. Arnold		Dayton, Ohio
Toledo & Ann Arbor	H. W. Ashley		Ann Arbor, Mich.
Tonawanda Valley	J. V. D. Loomis		Attica, N. Y.
Troy & Boston	E. Crandell	D. Robinson	Troy, N. Y
Toronto, Grey & Bruce	*Edmund Wragge	W. Watson	Toronto, Can.
Toronto & Nipissing	John Duncan	John Symons	Toronto, Can.
Tuckerton	J. J. Pharo		Tuckerton, N. J.
U			
Ulster & Delaware	Geo. Coykendall		Rondout, N. Y.
Union Pacific	*S. H. H. Clarke	A. D. Clark	Omaha, Neb.
Union Pacific	§Jas. T. Clarke		Omaha, Neb.
Eastern Division	P. J. Nichols		Omaha, Neb.
Western Division	W. B. Doddridge		Evanston, Wy. T.
Mountain Division	Robert Law		Cheyenne, Wy. T.
Laramie Division	Edw. Dickinson		Laramie, Wy. T.
Colorado Division	A. A. Egbert		Denver, Col.
Kansas Division	S. T. Smith		Kansas City, Mo.
Kansas Division	O. H. Dorrance		Denver, Col.
Denver & S. Park Division	C. W. Fisher		Denver, Col.
Utah Central	John Sharp	S. H. Hill	Salt Lake City.
Utah Northern	Geo. W. Thatcher		Logan, Utah.
Utah Southern	John Sharp		Salt Lake City, Ut'h
Utah Western	*W. W. Riter	W. W. Riter	Salt Lake City.
Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca & Elmira	Geo. J. Rice	J. L. Greatsinger	Horse Heads, N. Y
V			
Vaca Valley & Clear Creek	G. B. Stevenson		Vacaville, Cal.
Valley	Samuel Briggs	Samuel Briggs	Cleveland, O.
Vicksburg & Brunswick	W. G. Raoul		Macon, Ga.
Vermont Valley	John Mulligan		Springfield, Mass.
Vicksburg & Meridian	*John Scott	E. F. Raworth	Vicksburg, Miss.
Vicksburg, Shreveport & Pacific	*John Scott		Monroe, La.
Vicksburg, Shreveport & Pacific	F. Y. Dabney		Monroe, La.
Virginia & Truckee	H. M. Yerington	C. P. Mason	Carson, Nev.
Virginia Midland	Peyton Randolph		Alexandria, Va.
W			
Wabash, St. Louis & Pacific	*John C. Gault	R. W. Green	St. Louis, Mo.
Eastern Divisions	R. Andrews		Toledo, O.
Ohio & Ind.	G. W. Stevens		Fort Wayne, Ind.
Illinois	H. F. Clark		Springfield, Ill.
Rantoul	T. B. Burnett		Rantoul, Ill.
Chic. & Iowa Divisions	W. F. Merrill		Chicago, Ill.
Chicago	A. H. Wood		Chicago, Ill.
Peoria	F. L. Tomkins		Peoria, Ill.
Iowa	E. N. Armstrong		Keokuk, Ia.
Western Divisions	Theo. McKissock		St. Louis, Mo.
St. L. K. C. & N.	G. B. Parcell		Moberly, Mo.
C. Bluffs & Omaha	J. W. Blanchard		Stanberry, Mo.
Kansas City	M. G. Cary		Kansas City, Mo.
Quincy, Mo. & Pacific	F. D. Schermerhorn		Quincy, Ill.
Wabash, Chester & Western	J. L. Hinkley		Chester, Ill.
Wallkill Valley	J. H. Jones		Rondout, N. Y.
Warwick Valley	Grinnell Burt		Warwick, N. Y.
Washington & Ohio	R. H. Havener	R. H. Havener	Alexandria, Va.
Waynesburg & Washington	Jacob Swart		Waynesburg, Pa.
Welland	William Pay		St. Catherine, Ont
West Feliciana	J. B. McGehee	J. B. McGehee	Bayou Sara, La.
West Jersey	Jos. Crawford		Camden, N. J.
Western Counties	J. Brignell		Yarmouth, N. S.
Western of Alabama	*Cecil Gabbett	Cecil Gabbett	Montgomery, Ala.
Western of Atlantic	Wm. McRae	W. R. Webster	Atlanta, Ga.
Western Maryland	*J. M. Hood	J. M. Hood	Baltimore, Md.
Western North Carolina	A. B. Andrews	Geo. P. Erwin	Asheville, N. C.
Whitewater	W. W. Worthington		Ft. Wayne, Ind.
Whitby, Port Perry & Lindsay	*Jas. Holden		Whitby, Ont.
Wicomoco & Pocomoke	H. R. Pitts		Berlin, Md.
Williamstown	J. F. Bodine		Williamstown, N.J.
Wilmington, Columbia & Augusta	J. F. Divine	J. F. Divine	Wilmington, N. C.
Wilmington & Northern	J. H. Thompson		Coatesville, Pa.
Wilmington & Weldon	J. F. Divine	J. F. Divine	Wilmington, N. C.
Windsor & Annapolis	*P. Innes		Kentville, N. S.
Wisconsin Central	*F. N. Finney	J. W. Curtiss	Milwaukee, Wis.
Mil. & Eastern Div.	C. F. Dutton		Milwaukee, Wis.
So. Mid. & Northern	G. Campbell		Steven's Point, Wis.
Wisconsin Valley	F. O. Wyatt		Tomah, Wis.
Woodstock	J. G. Porter		Woodstock, Vt.
Worcester & Nashua	G. W. Hurlburt	C. S. Turner	Worcester, Mass.
Worcester & Shrewsbury	J. F. Bigelow		Worcester, Mass.
Worcester & Somerset	F. J. Palfrey		Philadelphia, Pa.
Y			
Youghiogheny	Wm. Wilson		Irwin's, Pa.

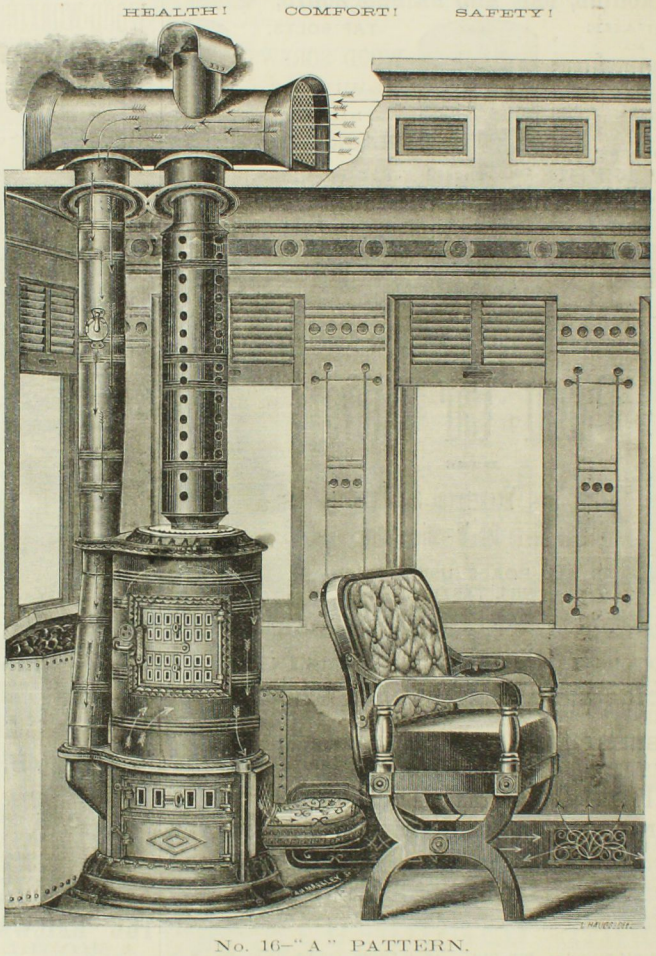
SPEAR'S

Improved Anti-Clinker Railway Car Heater & Ventilator.

HEALTH! COMFORT! SAFETY!

WE CLAIM FOR OUR HEATERS THE FOLLOWING ADVANTAGES OVER ANY OTHER IN USE FOR RAILWAY CARS.

1.—An equal quantity of hot air is distributed throughout the car.
2.—Persons sitting near the stove are not hotter than those at a distance, and are not obliged to open the windows, to the annoyance of others.
3.—All the impure air is driven out at the top of the car.
4.—The air in the car never comes in contact with the heated surface of the stove, as all the air that is heated is brought fresh from the outside—thus heating and ventilating the car at the same time.
5.—There is no danger of fire from sparks setting clothing taking fire by coming in contact with the stove.
6.—In numerous cases where cars containing this stove have been overturned, it has never been known to set fire to the car, or even to be moved out of its place.



No. 16—"A" PATTERN.

An important feature about our Heaters is the PATENT ANTI-CLINKER GRATE.

The object of this invention is to **remove the ashes and clinkers from the fire-pot without dropping the fire out.** This can be done with less trouble than it takes to rake the old kind of stoves, and a **continuous fire** be kept gone **always fresh** on the grate. By this means the entire surface of the Stove can always be relied on for heat; but in other stoves, when the grate surface becomes covered with clinkers, and the cylinder half filled with ashes and clinkers, only the upper surface will afford heat—thus very often resulting in the overheating and ruining of the stove. With our **Improved Grate**, the base of the stove is always hot. In this stove we give **a bottom as well as a top view of the fire**; whereas in all other stoves the fire can only be seen from the top. With this improvement **we can always** tell when the fire requires raking.

We invite special attention to the above cut, which illustrates our improved Anti-Clinker Car Heater and Ventilator. Many devices have been tried for heating and ventilating railway cars, and most of them have proven failures, but by our improved plan, cars can be thoroughly heated and ventilated. The fresh air is taken in at the top of the car through the ventilator, passing down a pipe to the base of stove, around the heated cylinder, and through a 4×6 tin pipe along the side of car, escaping through registers between the seats, thus warming the feet of passengers, thoroughly heating the car, and forcing the foul air out through the top openings. In making the attachment from heater to tin pipe we use a cast-iron elbow, which makes a complete connection between the heater and hot-air pipes. Persons who travel in railway cars know how uncomfortably hot the seats are near the stove, and how often they are obliged to raise the windows, to the annoyance of passengers at a distance from the stove, who are suffering from the cold; and also how **ILLY VENTILATED** most cars are, on account of the air in the car coming in contact with the heated plates of the stove.

WOULD BE PLEASED TO HAVE YOU CONSIDER OUR IMPROVEMENT AND THE UTILITY OF USING IT IN YOUR CARS.

JAMES SPEAR,

1014 and 1016 Market St., Philadelphia.

Also Broad Hatchets, Axes and

NO MORE HOT BOXES!

EAGLE CAR-BOX LUBRICATOR COMPANY.

We can give the highest of references, including some of the best roads in the United States. We claim that our compound is a perfect cooler; saves brasses, and trouble and annoyance of frequent greasing. This is abundantly proved by our continual orders from railway companies, who are deriving the greatest satisfaction from its use.

We sell in quantities of from five barrels to car loads, and no charge is made unless it proves satisfactory.

TRADE MARK.

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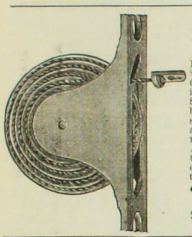
Address A. G MANDEL, General Manager, P. O. Box 2555; Office, 26 Burling Slip, New York.



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WE INVITE ATTENTION TO THE WONDERFUL LUBRICATING AND LASTING PROPERTIES OF THE

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We invite correspondence, and, to such parties as desire it, we will ship one barrel or more as a trial, asking pay for only such as is used.

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Gravity, 26°, 27°, 28°, 29°. Cold Test, 10° to 15° below zero.

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Showing Better Results than any Oil Extant.

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